APPENDIX II

TAB I

IN THE UNITED STATES DISTRICT COURT

FOR THE MIDDLE DISTRICT OF PENNSYLVANIA

TAMMY J. KITZMILLER; BRYAN REHM; DEBORAH F. FENTIMORE; JOEL A. LIEB; STEVEN STOUGH; BETH A. EVELAND; CYNTHIA SNEATH; JULIE SMITH; ARALENE D. CALLAHAN ("BARRIE"); FREDERICK B. CALLAHAN, Plaintiffs, vs. DOVER AREA SCHOOL DISTRICT; DOVER AREA SCHOOL DISTRICT BOARD OF DIRECTORS, Defendants.	CIVIL ACTION No. 4:04 CV 2688

DEPOSITION OF SCOTT MINNICH, Ph.D.

TAKEN ON BEHALF OF THE PLAINTIFFS

AT MOSCOW, IDAHO

MAY 26, 2005, AT 8:45 A.M.

REPORTED BY:

NEIL COOLEY, C.S.R.
Notary Public

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APPEARANCES

MR. ALEX J. LUCHENITSER, Attorney at Law, Senior Litigation Counsel, Americans United for Separation of Church and State, 518 C Street, NE, Washington, D.C. 20002, appearing for and on behalf of the Plaintiffs.

MR. EDWARD L. WHITE, III, Attorney at Law, of the Thomas More Law Center, 24 Frank Lloyd Wright Drive, P.O. Box 393, Ann Arbor, Michigan 48106, appearing for and on behalf of the Defendants.

ALSO ATTENDING:
Nicholas J. Matske, Public Information Project Specialist

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THE DEPOSITION OF SCOTT MINNICH, Ph.D., was taken on behalf of the Plaintiffs on this, the 26th day of May 2005, at University of Idaho, Life Sciences Building, Room 144, Moscow, Idaho, before M & M Court Reporting Service, Inc., by Neil Cooley, Court Reporter and Notary Public within and for the State of Idaho, to be used in an action pending in the United States District Court for the Middle District of Pennsylvania, said cause being Civil Action No. 4:04-CV-2688 in said court.

THEREUPON, the following proceedings were adduced, to wit:

SCOTT MINNICH, Ph.D.,

a witness having been first duly sworn to tell the truth, the whole truth, and nothing but the truth, relating to said cause, deposes and says:

EXAMINATION

QUESTIONS BY MR. LUCHENITSER:

Q. Dr. Minnich, could you please state your name for the record?

A. Scott Arthur Minnich.

Q. And have you had your deposition taken before?

A. Never.

Q. I'm just going to give you some standard

instructions. Please answer all the questions orally. Please don't nod your head or say uh-huh or huh-uh, because then the court reporter won't be able to take down your answer accurately.

If you do not hear a question or don't understand a question, please tell me. Please wait until I have finished asking my question before you begin your answer. And if you realize that an earlier answer you gave was inaccurate or incomplete, please say that you would like to correct a former answer and I will give an opportunity to do so.

And if your attorney objects to one of my questions, you are still required to answer the question unless your attorney instructs you not to answer.

And do you understand the instructions I have given you?

A. I do.

Q. And do you understand that you under oath and are required to tell the truth?

Q. I do.

Q. Is it correct that you are serving as an expert for the defendants in this case?

A. Yes.

Q. Let me pull out your expert report, and we are going to mark that as Exhibit 1.

(Deposition Exhibit No. 1 marked for identification.)

BY MR. LUCHENITSER:

Q. We have marked as Exhibit 1 the expert report of Scott Minnich. And if you could flip to Exhibit A to Exhibit 1, which is the biographical sketch in the back, please, does that Exhibit A correctly reflect your educational and employment history?

A. It does.

Q. And is everything in there still correct or current or has something changed since you submitted it?

A. No, it is still current.

Q. What were you asked to give an opinion about by the defendants in this case?

A. The theory of intelligent design and how it fits into this case in Dover, Pennsylvania.

(Off the record.)

MR. LUCHENITSER: Back on the record.

BY MR. LUCHENITSER:

Q. Were you asked to give an opinion about anything else?

A. No.

Q. And can you tell me what the principal opinions you have in this case are?

A. That intelligent design is a viable scientific theory.

Q. Anything else?

A. No, I mean in terms of my expertise in this case, you know, it is whether or not intelligent design is a competing theory in part to the current consensus in biology.

Q. When you say intelligent design is a viable scientific theory, can you explain what you mean by viable?

A. In other words, it is looking at the public evidence and interpreting that evidence in the sense that the design we see in nature is real design, not just apparent design, which most of my colleagues hold the latter view.

Q. Uh-huh, so when you use the word viable, do you mean it is real?

A. It's real, it's real, okay? It is science, it is not a religious position. It has metaphysical implications, like evolution does, but that is incidental, secondary to its explanatory power when we look at the facts and experiences that

we see in the natural world.

Q. What are the metaphysical implications that intelligent design has?

A. That there is design behind it, that there is an intelligence in part responsible for what we see.

Q. And let me ask you, why do you use the word metaphysical?

A. Well, it is philosophical, metaphysical. I mean, in that realm it doesn't require a religious position, you know? It can be more of -- a person can hold the view of intelligent design as being real and believe in the God of Espinoza or Einstein, the God of the philosophers, not of a traditional God that we think of in the context of traditional religions.

Q. Does your report identify all the subject matter that you are going to testify about at trial?

MR. WHITE: I have to object because I couldn't hear you.

BY MR. LUCHENITSER:

Q. I'm sorry, does your expert report identify all the subject matter that you will testify about at trial?

A. That's an absolute statement, and being a

scientist I always hesitate. But this is -- in terms of my own research and training, it is reflected in this report.

Q. Do you intend to express any opinions in this case that have not been included in your report?

A. If I am asked a question that is not directly applicable to this report, I may choose to respond or not if I have knowledge in the area. No, this isn't a complete tome of all the knowledge that I have.

Q. Do you have any plans to supplement your report in any way?

A. No, not at present.

Q. Do you consider yourself an expert on any issues relevant to this case?

A. As they bring to bear on examples that are being disputed by both camps, you know, the area of irreducible complexity of the bacterial flagellum, molecular machines, genetics, microbiology.

Q. What is -- do you have an area of specialty within the discipline of biology?

A. I do, I am a microbial geneticist focused on an area we refer to as microbial pathogenesis,

organisms that cause disease.

Q. Has that area been the focus of your professional research?

A. Yes.

MR. WHITE: Object as far as what time frame you are talking about for his professional research.

THE WITNESS: Yes, currently. I have had other experiences, too. I have been in diagnostics, I have been in developmental biology, and -- I'm trying to think in terms of just how you quoted this, basic molecular biology, molecular genetics.

As an example, the controversy about genetically engineered foods and BT toxins. I don't know whether you are familiar with this at all, bacillus thuringiensis toxin. This has been incorporated into agricultural plants and has been controversial because of the ethical concerns about introducing or modifying plant genomes.

But that bacillus toxin gene I cloned as a post-doc, and we gave it to Monsanto 20 years ago.

So occasionally I am called to -- in fact, four or five years ago I had my research notebooks subpoenaed because of a patent lawsuit involved in who owned the rights to that. That was

between Monsanto and some other company in terms of who had the right to that gene.

Q. Would you consider yourself an expert in evolutionary biology?

A. That's a difficult question and I want to qualify it, because I was challenged here at the University of Idaho several years ago when Robert Pennock came and gave a seminar. And he knew my position and he challenged me in the audience with respect to, "How can you, as a practicing contributing scientist, hold the position that is contrary to the very foundation of your discipline?" Okay? This is in front of all of my colleagues and students in a formal departmental seminar.

And I responded that, "That's an interesting question, and now that you have raised it, I'm sure a lot of people are interested in my response."

What I find interesting in my own experience, and that of colleagues in this department -- and we are the most highly funded and I think the most successful in getting extramural funding, publication in peer-reviewed journals, we have several new faculty so I don't want to make an absolute statement, but, you know, the past couple

of years -- but at that time nobody in this department, as a student or post-doc, had taken, except for one person, a formal course in evolution. None of them, except for one person, had read Darwin's book.

So when you say an expert on evolution, you know, we are all biologists and we are all contributing biologists, but in our training we have not been required to study formally evolution as a subject.

So I would say I am not, per se, an expert. I know a lot about it. I think I understand it clearly. But in terms of, you know, looking at my transcripts through graduate school, undergraduate school, post-doctoral training at Purdue and Princeton, you will find no evidence that I took a course in evolution.

In fact, when I wanted to as a graduate student my mentor dissuaded me from doing it. He said pretty derogatory things about it.

Q. So you have never actually taken a course in evolution?

A. And that's the common experience for most of my colleagues throughout my career.

Q. Right, and that's your experience. I was

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just trying to make a point that that's your experience.
A. Right. Right.
Q. So you would not hold yourself out as an expert on evolution?
A. I think I can hold my own, I think I can hold my own in terms of this debate. I have done a lot of reading on my own, but how do you measure who is an expert?
If you look at publications, contributions that are formal in that discipline, no, you are not going to find them on my resume.
Q. So have you had any training in evolution, other than just reading stuff on your own?
A. I think in the informal discussions and debates at meetings when these topics come up, I am very interested in the subject and will participate.
Q. What have you read about evolution?
A. Well, I mean, I have read Darwin, you know? I have read Dennett, I have read Dawkins, I have read a number of books, perused the journals, any journals that touch on evolution, infectious disease, I pay attention to them.
Q. Have you ever taught any courses in

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evolution?
A. No.
Q. And is it correct -- you might have said this already, is it correct that your department at the University of Idaho does not offer a course in evolution?
A. Our department does not. Biology does, and this is another thing that I found interesting, is that -- to clarify the statement, in talking about Pennock, that our department does not require nor does it offer evolution even as an elective. And at the time period when Pennock was here, biology offered a course in evolution, but it was a 400 level course.
Now they have since changed that, I think in part to my criticism. But if it is so necessary to have a firm understanding of evolution to do biology, why do you offer it as a 400 level course? So now that has been brought down into the 100 level.
Q. Just to clarify the record, is it correct, Doctor, I want my understanding to be correct, you have not had formal training in evolution and your of knowledge of evolution is based just on reading articles and discussions with

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colleagues, is that accurate?
MR. WHITE: Objection as to what you mean by formal training.
THE WITNESS: I haven't had a formal designated course in evolutionary biology. Now, it has been a component of courses that I took as an undergraduate, general biology. There would be a section on evolution that dealt with mutation and natural selection, Haeckel's embryos, peppered moss, the standard fare back in the 70s, but it was pretty shallow.
Q. That was as an undergraduate?
A. Right.
Q. Have you done any research in the field of evolutionary biology?
A. I have dabbled in it in terms of antibiotic resistance, which is in my expert report, it's an interesting one.
Q. Can you explain what you mean by dabbled in it?
A. In other words, we have done a series of experiments, we haven't published them yet just because at the time we were doing them, there were other groups that were doing it as well, and they published much of the same information that we had.

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And it wasn't a focused -- the primary focus of my own work, so, you know, I just kind of let it slide, although I think we have got some interesting contributions to make. When I get time I will go back.
Q. What was the purpose of the research you were doing on the antibiotic resistances?
A. I was interested in the general ramifications, because if you look at the conversations in this area in terms of evidence for evolution, antibiotic resistance is a very common component to those arguments, whether you see it in National Geographic last November, you know? I mean, this is part of the overwhelming evidence.
And I was interested in terms of what the fitness costs are associated with antibiotic resistance and does it really fall into the series of observations where you have mutations that are contributing to the long term what I call complexifying mutations that are driving evolution from simple to complex systems.
Q. Have you published any articles in the field of evolutionary biology?
A. No, I have -- I think some of my work has implications in terms of evolution. But not

formally, that's not my area of interest or, you know, primary research.
Q. Would you hold yourself out as an expert in paleontology?
A. No.
Q. Do you have any training in the field of paleontology?
A. No.
Q. Would you hold yourself out as an expert in the field of systematics or taxonomy?
A. I have experience in that. Microbiologists are taxonomic. You know, the systematic bible is Burgy's Manual of Determinative Bacteriology. And I took a course in systematics as a graduate student from the editor of Burgie's Manual, so I am familiar with systematics.
Q. The course you took, or the training you took in systematics, did it relate only to systematics at the microbiology level --
A. Right.
Q. -- or did it relate to -- did it cover systematics at the organismal level?
A. No, I mean it was a microbiology course.
Q. Do you have any training in systematics or taxonomy at the organismal level?

A. I mean, I have had experience as an undergraduate and graduate student taking systematics courses or having it as a component of my training, how you go through a systematic key and look at phenotypes, or now as we employ genotypes, and look at associations in terms or relatedness.
Q. Is it correct you would not hold yourself out as a expert in systematics or taxonomy?
A. No, that's not my field.
Q. Would you hold yourself out as an expert in biology at the organismal level as opposed to the molecular level?
A. Again, I am a prokaryotic molecular biologist, so I deal with haploid organisms and that's my focus. I'm not an expert in terms of mammalian zoology or taxonomy, if that's what you are asking.
Q. And have you had any training in biology at the organismal level?
A. In terms of course work, yes, I have. I mean, I have taken micrology courses that are a pretty broad group of organisms. And I have taken courses in zoology and vertebrate zoology, but that was years ago and things have changed dramatically in terms of that.

Q. Was that also as an undergraduate?
A. Undergraduate or early graduate student.
Q. Do you have any training in the fields of information theory or probability theory or statistics?
A. General statistics I have had courses in, but I am not a statistician.
Q. So you would not hold yourself out as an expert in any of those areas?
A. No, if I need to use statistics, I make sure that I hook up with a statistician and go over our data and make sure our interpretations are not -- you know, are valid.
Q. Do you have any expertise or training in the field of gene sequence comparison?
A. Yes, I do that routinely.
Q. Do you have any expertise or training in the field of genetic engineering?
A. Yes. Yes, I mean, I publish in this area, I use it all the time in my own research.
Q. Have you actually engineered any life forms?
A. Yes, like I said, as a post-doc we cloned bacillus thuringiensis toxin and that was handed over to Monsanto, and they incorporated that into

soy beans and into corn and other plants. So in terms of the forefront of genetic engineering, that was one the first major applications.
I have modified organisms routinely. We use site-directed mutagenesis, making fusion proteins for analysis of gene regulation, deletions, insertion of new information. That's our bread and butter.
Q. Do you have any expertise or training in the fields of astrophysics, astronomy?
A. No.
Q. Cosmology?
A. No.
Q. Astrobiology?
A. No.
Q. Would you consider yourself as an expert in the field of intelligent design theory?
A. I am a contributor and I know the literature pretty well and the people involved, so it is a young, young field. But, yes, I mean in part that's why I am here.
Q. What sort of training have you had in this field?
A. I am a trained molecular biologist, so in terms of scientific expertise, you know, I think a

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lot of us recognize that advances in science aren't so much generating new data, new information, but it is looking at old information in new ways. In part this is the contribution of intelligent design.

Q. Have you ever taught any courses in intelligent design theory?

A. No.

Q. What sort of research have you done in the field of intelligent design theory?

A. Again, that's a -- to me that's a loaded question. I look at -- much of what I have done and published is having implications in design theory. You know, dissecting the macromolecular machinery of the bacterial flagellum and looking at its genetic programing, I think that has great implication in terms of design theory, intelligent design in terms of how we look at these things.

But in terms of formal presentation? I have one publication that was in a meeting where I designed the nature --

Q. The 2004 article with Mr. Meyer?

A. Right.

Q. With respect to the research that you were discussing that relates to intelligent design theory, was the primary purpose of any of that

research to somehow advance intelligent design theory?

A. No, no, I think it is implicit in the work. You know, this is one thing I would emphasize in terms of how science works. Forty years ago, 30 years ago we didn't know about macromolecular machines. We assumed, as I mentioned in my expert report, the article by Bruce Alberts when he was a graduate student in the sixties, they looked at the cell as essentially a bag of enzymes which are colliding on second-order kinetics, okay? A pretty primitive view of the cell. Now we see it as a consortium of macromolecular machines that weren't anticipated.

And so when I look at bacterial flagellum, it is -- Howard Berg, at Harvard, has referred to it as the most efficient machine in the universe. That's a pretty astounding statement in terms of something that on one side we hold as a product of, you know, unpurposeful, unintelligent cause.

So I think it is imperative, now that we have all this new understanding, to go back and ask is natural law efficient to produce sophistication of the systems that we are studying.

Q. So is it correct that the research you have done, with respect to all the research that you have done as it touches on intelligent design theory, the purpose of that research was something else, it wasn't --

A. Yes, it's an understanding in terms of basic biology, how does this system work? What are the components? Who are the players in this game? How are the genes regulated? How is it assembled, how is it synthesized, the controlling elements?

So, yes, you have a pretty sophisticated engine and it is the greatest fun in the world. It is like being a 17-year-old kid in a garage with a car and you can take it apart and put it back together, modify it, see how it works. It is part of the discovery process.

Q. Can you tell me what intelligent design is?

A. Intelligent design, you know, in the simplest sense, is asking the question: The design that we see in natural systems that all biologists agree is there, okay, from Dawkins to Francis Crick, et cetera, you know, is the design real or is it merely apparent? It's a simple question, there are two answers to it. Both of them are valid questions

that should be explored and both of them are going to have extremely interesting ramifications, okay?

So intelligent design is looking at nature and saying, is our current understanding of mutation, natural selection, time and chance, sufficient to produce the systems that we are studying, or are there other interpretations? Is there an intelligence behind it?

Q. And would you define intelligent design theory in the same way or would you give intelligent design theory a different definition?

A. No, it is all, you know, focused in the same goals. I mean, in part it encompasses -- it's a new area. How do you measure, how do you detect design, how do you quantify it? And that would be outside of my expertise, per se, but there are people that are working on those questions.

If you look at something, you know, if you are an anthropologist and you pick up a bunch of rocks and one of them is a piece of flint and has certain patterns that by experience we know is because of intelligence, how do we know that? I mean, we intuitively can look and say, "Okay, this is an arrowhead," but how do we quantify that in terms of real scientific methodology? This has been

Bill Dembski's contribution, probability, specificity, how that fits into real analysis.

Q. Is intelligent design theory only -- is it anything more than a field of study that attempts to determine whether design in nature is caused by an intelligent actor, or does it actually -- is it actually a theory that affirmatively claims that an intelligent actor did in fact design living beings? MR. WHITE: Objection, it's a confusing question.

THE WITNESS: Yes, go back and rephrase it because I want to understand.

MR. WHITE: One thing, so I understand, were you separating intelligent design from intelligent design theory or is it the same when you are asking these questions?

MR. LUCHENITSER: Well, it seems Dr. Minnich is not separating the two, so --

MR. WHITE: I just want to know, when you are asking the questions, so if you can rephrase this question -- sorry.

MR. LUCHENITSER: Okay, let me try to make the question less confusing.

BY MR. LUCHENITSER:

Q. There are two possible ways that someone

can understand what intelligent design theory is. The first way would be that it is just a field of study that attempts to determine whether an intelligent actor was responsible for the creation of a living organism or development, or, two, that it is in fact a scientific theory that actually in fact claims that an intelligent actor was in fact responsible for the design of living systems or beings, which one is it?

MR. WHITE: Same objection.

BY MR. LUCHENITSER:

Q. Was that clear?

A. Not really. Are you asking me, is it a theory or is it a law in the minds of the people that are carrying out --

Q. I am just trying to ask you, is it anything more than a field of study that hasn't reached any conclusions as to whether an intelligent actor is responsible for living systems or is it an actual scientific theory that in fact claims that an intelligent actor is responsible for the design of living systems?

A. I'm still a little bit confused on the distinction that you are trying to draw. I think it is taking --

MR. WHITE: Let me object if you are confused. Can you break it into two questions? Because it seems like you have a couple of questions mixed in there.

BY MR. LUCHENITSER:

Q. Let me try to summarize it. Is it a theory of detecting design in living systems or is it a theory of what actually has happened as far as whether systems were designed or not?

MR. WHITE: Object, compound.

BY MR. LUCHENITSER:

Q. I think you are probably getting it.

A. I think it encompasses both. I mean, it's a theory involved in detecting design, what are the hallmarks of design, there is a component of complexity and specification, pattern formation that outside of this data we can recognize things in our own experience that have design, and if we find them in nature, we infer that they are designed as well, okay?

Does it claim there is a designer, is that what you are asking?

Q. Yes.

A. It assumes that at this point. I mean, that's an area that I think is difficult to

pinpoint. Can I go to nature and say, you know, this was directly designed and this has been modified by natural laws of mutation and natural selection? No, I don't know at what point design is incorporated into the systems that we are looking at.

It is a new theory. I want to put it in that context. It is not meant to supplant our current ideas of evolution, I think it is going to compliment it. And this is often the case in the history of science where you have two competing ideas and over time you find that there are truths or components in both, okay?

My opinion from my experience is that natural selection, natural laws of chemistry and physics, time, are insufficient to explain both the complexity and the specification that we see in biological systems.

Q. Okay, on page one of your report you said, "Intelligent design theory is a scientific theory and it holds that the deep complexity and clearly evident design in organisms is the result of an intelligent agent."

MR. WHITE: Where are you?

MR. LUCHENITSER: That's the first

sentence on page one after the big bold-headed one.
THE WITNESS: Right. Right.
BY MR. LUCHENITSER:
Q. And is that your understanding of what intelligent design theory is?
A. That's my statement in terms of my --
Q. So that's your personal opinion?
A. Yes.
MR. WHITE: Objection, when you say personal opinion, you are talking about as a scientist, as an expert?
BY MR. LUCHENITSER:
Q. Your personal scientific opinion?
A. Right.
Q. Is that definition of intelligent design generally understood to be the correct definition among scientists that are studying and advocating for intelligent design?
A. In a broad sense, yes.
Q. And can you tell me why you said in a broad sense? Is there some sense in it which it is not agreed upon?
A. In terms of just asking, all right, in a thumbnail sketch, what intelligent design is, the theory is it is saying essentially this, that the

deep complexity, that apparent design is real design, is a product of an intelligent agent.
Q. Are there persons in the field of intelligent design who have not reached the conclusion that an intelligent designer is responsible for the deep complexity and clearly into, if you will, the deep complexity in organisms and are not sure about that matter?
MR. WHITE: Objection, confusing question. Did you understand the question?
THE WITNESS: Not -- I mean, what is the alternative? I mean, if something is designed and you hold that it is real design, then I think by definition there is an intelligence behind it.
BY MR. LUCHENITSER:
Q. Let me try to re-ask the question. You have concluded that there is a designer; is that correct?
A. Correct.
Q. Are there persons in the field of intelligent design who have not reached the conclusion as to whether or not there is a designer but are uncertain about that?
A. There are people that are to a degree, I think, agnostic in terms of that. I mean, David

Balinski has stated that he favors intelligent design because -- I don't want to put words in his mouth, but my understanding of his position, and I could be clarified, he agrees that there is real design but he is agnostic in terms of where that design is coming from, okay? In other words, it's a viable compliment to our current consensus position, it appears to be something more than just natural law at work.
Q. So is the conclusion that there is a designer, is that an integral component of intelligent design theory?
A. No, not necessarily, not necessarily. You know, designer has a broad interpretation as well.
Q. So is it the case that somebody can be a scientist in the field of intelligent design but can conclude there is no designer or that it is unclear whether there is a designer?
A. Are you asking are there scientists that believe there is no designer?
Q. Scientists that are in the field of intelligent design theory.
A. No.
Q. Are there any alternative definitions of

intelligent design that are different from the definition you gave in your report?
A. I think my written statement is consistent with my colleagues in terms of -- you know, I think there are philosophers of science in the intelligence design arena that are more articulate in terms of the philosophical implications of this.
Q. How would you define creationism?
A. Creationism, which I think is very different than intelligent design, uses biblical reference by which you judge science. In the traditional sense, scientific creationism held to a literal interpretation of Genesis and thought that that was an embodiment of truth and that science should be filtered through that viewpoint.
I disagree with that stand. In fact, I was never an active participant in scientific creationism as it went through the Louisiana and Arkansas debates, I thought it was out of balance.
Q. Is there a difference between creation science and creationism?
A. Well, in terms of definitions, yes, I think it is subtle. Creationism, again I think in the traditional sense as it is used in the public

arena, implies a literal interpretation of Genesis. Scientific creationism then tries to look at the body of scientific understanding and fit it consistently with that viewpoint of biblical interpretation.

Q. Is teaching of creationism or creation science -- is the teaching of that, that forms of life began abruptly -- begin abruptly in their basic types, for example, fish with fins and scales, birds with feathers and beaks and wings?

A. That's -- repeat the question because I want to make sure I understand it.

Q. Does creationism or creation science teach that forms of life began abruptly in their basic types? For example, fish began with fins and scales and birds began with feathers, beaks and wings?

A. That is my understanding, yes.

Q. What is the difference between intelligent design theory and creation science?

A. Intelligent design theory isn't dependent upon any formal religious writing or revelation in which you are trying to match the natural world to show consistency. It is simply looking at the science and asking the question: Is the design that

we all agree is there real or apparent? Okay? It is a valid question and I think we should be addressing it at a scientific level in our inquiries.

It is that simple, okay? It doesn't have any basis of going further than looking or devising theories or hypotheses to look at how you detect design. Our record of life on this planet, does it fit with an intelligent agent or, again, is natural law, in terms of physics and chemistry, of what we know of genetics, sufficient to produce the diversity that we see in life?

And you end right there, yes or no. It is an interesting question, it is a valid question, and it should be addressed. I mean, and that's why we are here, you know? That's what Ken Miller is writing about. Robert Pennock, he is asking the question, can natural law come up with de novo information?

Q. Does intelligent design theory reach any conclusions that are different from the conclusions reached by creation science?

MR. WHITE: Objection as to vagueness, ambiguity.

BY MR. LUCHENITSER:

Q. You can go ahead and answer.

MR. WHITE: If you understand the question.

THE WITNESS: Repeat it one more time, or let me ask a question to make sure I understand it.

Does creation science and intelligent design both come to the same conclusion, is that what you are asking?

BY MR. LUCHENITSER:

Q. Let just ask the question, does intelligent design theory reach any conclusions that are different from the conclusions reached by creation science?

A. Oh, for sure.

Q. What are the differences? What different conclusions does -- what conclusions does intelligent design theory reach that are --

A. Well, creation science, I think, is really an area of apologetics, religious apologetics. They want the science to validate the scriptural content of Genesis, okay? And intelligent design isn't going to go that far. You can say that -- looking at the data, what we know in terms of chemistry and physics, genetics and natural selection, that there is a real design, and you stop

there.

Q. Can you tell me what theistic evolution is?

A. Theistic evolution is the position, as I understand it, that there is a designer or creator that designed the universe, started the clock going, designed the laws of physics and chemistry, and that life, through those laws, emerged and has evolved. But it is more of an impersonal activity. In other words, the machine was started and is removed from that machine, so that organisms do evolve in terms of our common consensus.

Q. Can someone who believes in theistic evolution also believe that God in some way guides the progress of evolution?

A. Sure, I mean I think you have the entire spectrum of people that believe in a designer or creator in terms of his participation in the world as we know it.

Q. What is the difference between theistic evolution and intelligent design theory?

A. Theistic evolutionists, I think, agree that given, for instance, the planet earth in its early stages of development had incorporated in it all the necessary components for the emergence of

life and its subsequent diversity, that there is no input from the designer from that point, okay?

So it is really consistent with the Darwinian viewpoint that you just started it by an intelligent agent or God and then everything unfolds.

Intelligent design sees a more active part of a designer from the sense that from my own perspective I look at the bacterial flagellum, it has stators and rotors and propellers and u-joints, it is battery powered, it looks like engines that Mazda makes, in one sense, but it is much more sophisticated because there is an algorithm or program that directs its assembly from genetic information and it regulates the timing of synthesis and the position where it is assembled, that that is a product of intelligence.

And from my position you don't get these machines by totally natural process. I mean, they can change and evolve, I don't know at what level or to what extent, but the prototypic or aboriginal machine has all the hallmarks of design based on our experience of machines that we manufacture.

Q. Other than the ultimate claim that a designer or designers were responsible for the

development of life forms on the planet earth, does intelligent design make any other scientific claims?

MR. WHITE: Objection, it is misleading.

THE WITNESS: I'm not quite sure what you mean in terms of other scientific claims. Give me an example. You know, is it going to tell me that butter is better for me than margarine? I mean --

BY MR. LUCHENITSER:

Q. I guess let me try to see if I can rephrase it.

What is the scientific content of an intelligent designer, other than the ultimate assertion that there is a designer or designers?

A. That's the main principle, okay?

Q. Is there anything else?

A. I would have to think about it in terms of the question. So if we proceed, I will come back to that.

Q. Do you have an opinion, a personal opinion, as to who or what the intelligent designer is?

MR. WHITE: Objection as to are you asking for his personal opinion or his opinion as a scientist?

BY MR. LUCHENITSER:

Q. Do you have a scientific opinion as to who the intelligent designer is?

A. No.

Q. Do you have a personal opinion?

A. Yes, I do.

Q. You do. What is your personal opinion?

MR. WHITE: Objection as to relevancy. Go ahead.

THE WITNESS: I want to make sure that this is -- I mean, I have a problem in terms of giving my opinion, but my experience, when asked these questions, is that they are somewhat loaded. In other words, in my discussion with Robert Pennock when he was here and we were discussing type III secretory systems and the flagellum, claims of intelligent design, he then turned on me in this public audience and said, "Who is the creator?"

And I said, "Well, I have an opinion, but we are talking science, why do you want to bring religion into the question?"

No, "Who is the creator? Tell us who the creator is?"

And in part I think there is an attempt to marginalize people in this area as fundamentalists, you know, Christians that want to

get the bible back into the classroom, and that's invalid. But I am a Christian, that's my personal faith.

And I also would like to state for the record that that is not my family's faith tradition. I was an agnostic, probably an atheist, and when I took a course in biology and was confronted with the design in the bacteriophage Landa, it made me pause and think, is this the product of chance and necessity?

Okay, so I am a Christian because of the data, not despite it.

Q. So this experience led you to become a Christian?

MR. WHITE: Objection as of "this experience."

BY MR. LUCHENITSER:

Q. The experience when you were studying this life form?

A. No, I think it was a factor, you know, in my own personal journey, but I had no reason to -- at the point until I started taking biology classes -- in fact, I was an English history major that took a general chemistry course that had a molecular biology component and was so fascinated by the

information that I changed my major, because I was interested in the science, the beauty of the science, and the more I studied, it had implications.
Q. This is when you were an undergraduate, did you say?
A. Right.
Q. So is it correct that your personal opinion is that the intelligent designer is the God of Christianity?
A. Yes.
Q. Is there a consensus within intelligent design theory as to who the designer is or what it is?
A. No.
Q. Does intelligent design theory make any claims as to who or what the designer is?
A. No, in a formal sense it doesn't. It says you can infer design and therefore designer, but that's as far as the science goes.
Q. Does intelligent design theory rule out any type of possible designers?
Q. Not necessarily.
Q. Does intelligent design theory rule out all possible and natural actors as designers?

A. Natural what? I didn't hear your --
Q. Natural actors.
A. Natural actors?
Q. Yes.
MR. WHITE: Objection, vague, ambiguous. What do you mean by natural actors?
BY MR. LUCHENITSER:
Q. Under intelligent design theory, is it possible that space aliens could be the designers?
MR. WHITE: I didn't hear what you said, under what?
BY MR. LUCHENITSER:
Q. Under intelligent design theory, is it possible that space aliens could be the designers?
A. Sure.
Q. Is it possible that time traveling humans could be designers?
A. I don't know. I mean, that's speculation. I don't know. I mean, that's asking me to speculate on time travel, which is a hypothetical situation, and so I don't think it is really pertinent to my contribution or expertise.
Q. Has any work been done within intelligent design theory relating to the issue of who the designer is?

A. Not to my knowledge.
Q. Does intelligent design theory hold that there is only one designer or is it -- can it be consistent with intelligent design theory that there might be multiple designers?
A. No, I mean -- again, you can just infer design from the public evidence and, you know -- I mean, we have multiple engineers that work in consortia to produce machines today, who is to say it is not true in the biological world? I don't know.
Q. And under intelligent design theory, is it possible that the designers are -- that there might be multiple competing designers?
A. I don't know. I don't know what you mean by in terms of competing designers.
Q. As opposed to designers who are working together with each other, designers who are trying to come up with life forms that end up competing or opposing each other?
MR. WHITE: Objection, calls for speculation.
BY MR. LUCHENITSER:
Q. Is that possible under your theory?
A. Yes, I mean, that's speculative, and I

think it would be too early to say, but I wouldn't rule it out. I mean, again -- never mind, I will leave it at that.
Q. Is intelligent design theory in any way intended to eventually determine which of these possibilities is the designer?
A. No, not formally. I think it will have implications, but it is not -- no, no, I think -- you know, the book is open in terms of the implications of who the designer is. That translates into philosophy and religion and, you know, there is plenty of writing and experts on that.
Q. So do I understand you correctly that the theory is not even going to try to determine who or what the designers are or is?
A. I think there are people within the design community that have opinions with respect to that, but, you know, from my own perspective I don't have an agenda.
Q. Are there any kind of experiments or empirical studies that could be done in order to attempt or help determine who or what the designer or designers is or are?
MR. WHITE: Are you speaking currently?

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I didn't get the question, I guess.
THE WITNESS: Are there people that are actively participating in the intelligent design movement to identify who the designer is?
BY MR. LUCHENITSER:
Q. Well, actually I will ask another question.
A. No, again, at this stage saying is a design apparent or is it real?
Q. Are there any experiments or empirical studies that can be done to try to shed some light on what the nature of the designer is?
A. No, not to my knowledge.
Q. Do you have a scientific opinion as to how often the designer intervenes in the development of living systems or beings?
A. No, at this point it is too speculative. I mean, it evolves around the question in terms of what is the genetic capacity of any organism to change? I don't know the answer to that question, nor do any of my colleagues that are Darwinists or evolutionists, that's an open-ended question.
Q. Do you have a personal opinion on that question?
A. I think it is limited. From the

experiments that have been done by Lenski at Michigan State, you are running E. coli through -- or Saccharomyces cerevisiae through 20,000, 30,000 generations in a hemostat, and you end up with the same organism. And there are minor variation, depending upon what selection -- what selective pressure you apply, but the change is surprisingly little.
MR. WHITE: Alex, when you ask the question, you are asking for which type of opinion, personal or scientific?
MR. LUCHENITSER: That was a personal opinion.
MR. WHITE: Just off the record.
(Off the record.)
MR. LUCHENITSER: Back on the record.
BY MR. LUCHENITSER:
Q. So let's go back to the question of how often the intelligent designer intervenes. Is it your belief that it is fairly often? Would you say more than once every few million years?
A. That's speculation, I have no idea at this point.
Q. Do you have a belief as to whether the intelligent designer only intervened in the early

history of life on the earth or whether the intelligent designer kept intervening periodically afterwards?
MR. WHITE: Objection, asked and answered. Go ahead. It's the same question.
THE WITNESS: Again, I am not committed at this point.
BY MR. LUCHENITSER:
Q. Do you have a personal belief on the matter?
MR. WHITE: Objection as to relevance.
THE WITNESS: I mean, my own personal belief, I have some speculations but I hold them as speculations. Going back to the record, I am not a paleontologist, although I have read some Stephen Jay Gould. When you look at the fossil record, the lesson of the fossil record is stasis, not modification. So that a turtle nowadays looks like a turtle 30 million years ago.
So we have got the Cambrian explosion where we can look at the fossil record from the evidence that we have now, and this may change, I don't know, that there are very -- I mean, there are organisms that are present below the Cambrian strata and then suddenly you have this biological big bang,

body forms in a fairly -- patterns that are consistent with organisms we find today that appear to have a sudden appearance.
Again, I'm not willing to speculate in terms of where the designer interjected his design. I know that there are aspects of Darwinism that are going to hold true.
I mean, again the history of science is where you have two competing ideas, theories, or you are looking at new data and trying to incorporate it into our existing interpretations, there will be individuals that are on the extreme sides of each. But in general, you you will find that there will be a melding or a blending of these ideas as we get a better handle and more data.
Q. So do I correctly understand that you have no scientific opinion as to how often the intelligent designer creates?
A. No.
Q. Would I also be correct in assuming that your personal opinion with respect to the Cambrian explosion, for example, would be that the intelligent designer was responsible for the Cambrian explosion?
A. It is consistent with the design

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hypothesis. It is a problem for the Darwinists and they recognize it, and that is in the published literature, that there are evolutionary biologists that look at Cambrian explosion as a problem, from Simon Conway Morris in the U.K. to people in this country.

There are problems in our current understanding of biological systems and how you can get spontaneous generation or the arrival of the first ancestral organisms from a Darwinian perspective.

Q. Are you aware of any scientific literature in the field of evolution that holds that what we call the Cambrian explosion was not as sudden an event as scientists might have thought 23 years ago, but was more of a gradual event?

A. We know from the geologic history the time period that is involved. I'm not an expert on that, but it is -- from geological time it is pretty short. And yet again, it has got to be viewed from a perspective. If it is 40 million years geologically, yes, that's a breath. But at the same time, you know, we have a hard time imagining that from our own experience.

Q. Does intelligent design theory have any

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-- does intelligent design theory draw any conclusions as to how often the intelligent designer intervenes?

A. No. No. I want to go back and qualify one statement before.

Until recently, you know, the consensus opinion in Darwinian theory was -- I mean, if you distill evolution down to a one-liner here, it is decent with modification, and there is the assumption that there is decent from common ancestors.

One of the papers that I submitted in my expert report is from Carl Woese, who is a prominent evolutionist at the University of Illinois. Anybody in this area knows who Carl Woese is. I mean, he led a whole generation of biologists sequencing ribosomal RNA for, you know, systematic purposes.

But he states that, you know, a lot of our ideas in evolution, including common decent from a primordial organism, were conjectures of 19th century biologists, but they were embedded in stone and became part of the theory.

Now our experience and his experience is that that's not necessarily so. There could have been multiple origins of organisms and we shouldn't

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limit ourself to a single common ancestor, a single root to the tree of life, but it looks like it is now spread out.

Now, that is consistent as well with the intelligent design interpretation, but again, where the designer is acting in this processes is too premature.

Q. Are you aware of any proposed experiments or empirical analysis or studies that would be designed to determine how often the designer intervenes?

MR. WHITE: Objection, over broad.

THE WITNESS: Yes, I mean, that's a broad question. And not formally, no.

I think again it goes back to the question of what is the limits of genetic change of any organism which is an unknown quantity, can Saccharomyces evolve into a basidiomyces from a saccharomyces, or something like this. Can a prokaryote evolve into a eukaryote, were those separate evolutionary events, you know?

But to directly ask the question: Where has the designer directly intervened? No. But if we know the question in terms of limits -- and part of this will come out empirically through genomic

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analyses, so that's why I say it is premature. We have 500 bacterial genomes now, a number of eukaryotic organisms, but this is in the last -- since 1994, whatever.

It has been surprising in terms of the implications of comparing genomes from different groups of organisms that we thought were disparately related and now we are finding that there is commonality, and that those bacterial systems are in the order of 20 to 30 percent unique DNA in different groups.

So these are questions that will bear on what you are asking, but not directly, it is going to be indirect.

Q. You said that the limits are unknown, and I understand you were referring to the limits to the extent which one living system or life form can evolve into another one?

A. Right.

Q. If the limits are unknown, how can intelligent design theory come to the conclusion that there an intelligent designer?

A. Well, how can on the other side you make assertions that there is no limit and that you can, as with Escherichia coli, evolve into an organism of

trillions of cells that can contemplate their existence in the universe, you know, supposedly without purpose?

So I think it goes both ways. It's a question, it's a broad question that impacts both sides of this debate.

Q. But let me try to re-ask my question. If the limits are unknown, how can intelligent design theory come to the conclusion that there is an intelligent designer? Don't you have to figure out what the limits are first before you can even come to that conclusion?

A. Well, that hasn't kept evolutionists from saying -- looking at public data and arguing that we are the product of natural law, chemistry, and physics, you know, without knowing. So they are extrapolating from the data saying that because we have simple organisms and complex organisms and we are going to accept a natural explanation in terms of the explanation of this diversity, one has evolved into the other through a series of gradual steps. I mean, that's going beyond the data, in my mind, in terms of the limits of understanding of the plasticity of the genome.

Q. I'll let Ken Miller respond to that, I'm

not going to try to -- I don't want to get into an argument with you.

But let me try to see if you can affirmatively answer the question. If the limits are unknown, how can intelligent design theory come to the conclusion that there is a designer?

A. Again, you go back to the question of looking at nature and seeing aspects of design that all biologists recognize is there. Okay? And by our experience is that design real or apparent?

There are going to be limitations from our present knowledge in terms of what contribution evolution has made in that diversity and modification of design, how much creativity is present in natural selection to modify organisms, and how much of it is fixed in the initial design of the organism, okay?

But I think from -- again, the fact that we are dealing with molecular machines that have all the hallmarks of manmade intelligently designed machines, we can infer there is a designer that has been active in our natural world. That's the limit, you know, in terms of where I am going to go. Where he injected his design, how many times he has participated in this, is conjecture.

Q. Are any experiments possible with respect to the question of how often the designer intervened?

A. I think so. Ultimately, these are questions that are being pondered in terms of how to address them. What is the, you know, what we call the sequence space in protein evolution? We look at the genetic code, we look at proteins as a true code. There are symbols involved in conferring information.

Are there limits to how that code can be used? Just like if you use the alphabet, we can randomly mix it together and get nonsense, you can also get words that convey information as well.

In the proteins, it may be the same thing. Proteins -- there may be sequences that are a subset of the possible combinations that will have activity in organisms. And as we get a handle on that, and there are people in the intelligent design working on this, Doug Axe, would be an example, that are looking at constraints of protein sequence in terms of function and randomness versus actual sequence function, okay?

Again, these are questions that are incubating at this point in terms of how they are

going to be addressed empirically.

Q. Does intelligent design theory have an opinion on how living things come into being?

A. What do you mean by coming into being, that they are created de novo or are modified from existing designs?

Q. Yes.

A. It's speculation at this point. I mean, people have opinions, but those are speculative.

Q. Is there consensus within the intelligent design field on that issue?

A. No.

Q. Do you have a personal opinion on that? First, let me ask, do you have a scientific opinion on that?

A. Rephrase the question so I am --

Q. Do you have a scientific opinion on the question of how living things come into being under intelligent design theory?

A. I have a scientific opinion that at this point is speculative, based on knowledge that from my experience and knowledge of the literature, organisms do have the capacity to change over time, no one is arguing that. But my position is that change is limited.

Q. So is it your opinion that when a new kind of organism first appears, the organism, on the one hand, is it developed from a previously existing organism or is it developed out of inanimate matter?

MR. WHITE: Objection, compound question.

THE WITNESS: I mean, ultimately whatever side you agree on, there has got to be either an intelligent molding of the elements of this earth into a living organism or it occurs spontaneously. Okay? So there is a spontaneous appearance of organisms. How that comes about, again that is speculative.

If you look at the fossil record, from my understanding, and I'm not an expert paleontologist, but from what I have read by experts in the area, there is a lack of intermediates. There is sudden appearance of organisms in the fossil record.

Does that mean they appeared de novo? Not necessarily. I can say, well, maybe there was some catastrophic environmental insult where the major forms of life were destroyed or went extinct and these other organisms that suddenly appear were a very specific niche or in low concentration and we don't have the record. I mean that's possible, I don't know. Do you see what I am saying?

In other words, as a microbiologist, maybe you can appreciate this, if I take a tube of Escherichia coli bacterium that is sensitive to an antibiotic, I can, from experience, know that within those billions of cells there are three or four that are resistant to Streptomycin.

Can I find them by just sorting through them? I don't have enough time in my life. If I put a selective pressure on them, I can uncover them. They were there in a minuscule quantity that is below my power of detection, but they were there nonetheless. And if I apply the right selection, the right catastrophe, they are there the next morning for me.

BY MR. LUCHENITSER:

Q. Can you give me some examples of a species that appear to have appeared suddenly in the fossil record?

A. Again, I think if you go back to the Cambrian explosion, you have all the present body plans, from my understanding, developmental patterns that are suddenly present.

Q. Do you have an opinion as to the – and I'm asking about your personal opinion, the various species that appeared at the beginning of the

Cambrian explosion, were they developed by the modification of other species or were they developed out of inanimate matter or did they just suddenly appear?

A. That's speculation.

MR. WHITE: Also objection, his personal opinion has no relevancy here. You are asking him -- he is here as an expert.

THE WITNESS: Yes, like I said, I am not a paleontologist. But again, in my reading of the literature, this is a question, it's a problem in terms of sudden appearance of organisms in the geologic record, the lack of transitional forms.

The record of biology on this planet is one of extinction, that's the most common event in terms of looking at the overall record, okay?

BY MR. LUCHENITSER:

Q. Do some adherents to intelligent design theory believe that organisms appeared either out of inanimate matter or out of just nothing?

MR. WHITE: Objection, calls for speculation, no showing he has personal knowledge.

THE WITNESS: Yeah, I mean I haven't talked to people specifically about that. I mean, de novo appearance, out of nothing, you know, other

than inorganic matter? Again, that's the problem on both sides in terms of mechanism. But we know that we are composed of the elements we find in the earth, and that's consistent with evolutionary perspective, if you believe in spontaneous generation, or design, if you believe in a designer or creator.

BY MR. LUCHENITSER:

Q. If children in the Dover School District were taught that life forms appeared out of nothing, do you think that that would be an incorrect teaching?

MR. WHITE: Are you asking a hypothetical?

BY MR. LUCHENITSER:

Q. Yes, hypothetical.

A. Hypothetical? From public evidence, no, because ultimately that's the question in terms of how life arose on this planet, and there are various opinions.

Let me put it this way. I think one of the major contributions to biology that made it transcend the really descriptive discipline of natural history into manipulative science, experimental science, was Pasteur's disproval of the

theory of spontaneous generation. It had profound implications in terms of how we conduct science in the biology arena, okay?

Any biologist that you ask on one level, you know, do you believe in spontaneous generation? If I take inorganic material, all the components and life systems: nitrogen, carbon, oxygen, hydrogen, et cetera, and mix them together, am I going to get organisms appearing spontaneously? They will say no.

Yet at the same time, to be a consistent Darwinist where you believe that the natural laws of chemistry and physics, chance and necessity, can produce life, you believe in spontaneous generation.

Q. Let me --

A. So going back to Dover, Pennsylvania, if you make the statement, you know, can life arise spontaneously? Yes, we know it happened, in terms of there was a period in geological history of this earth where there was no life and there was a period where it appears. Now, how that happened? If you are a materialist, then you are going to explain it in terms of natural law, you know? But if there is a design involved, then -- a designer involved, then it is an intervention of those natural laws that

allowed this to happen.

Q. Let me try to make what I am asking clear. Let's forget about how microscopic life forms originally arose and focus only on complex animal species.

Is it a tenant of intelligent design that it is possible that complex animal species might have appeared abruptly as opposed to developing from other animal species? For example, is it consistent with intelligent design that it is possible that dinosaurs might have just appeared abruptly instead of developing from smaller reptiles, or whatever evolution holds their predecessors would be?

MR. WHITE: You are asking him as an intelligent design theory?

THE WITNESS: All I would say, what is appropriate is that if we look at life on this planet, if we look at the geological record, there is the sudden appearance of different diverse life forms. That's the record. How that happened, the mechanism, was there an intelligent agent? Hypothetically, yes. Can these things evolve one to the other? Hypothetically, yes. And I would leave it at that.

This an active area of research, it is

legitimate to be asking these questions, it is legitimate to present them to students, but not to go beyond our current body of knowledge. And when you get into speculation, recognize it as speculative.

Q. So intelligent design doesn't make any claims or assertions as to whether on the one hand, A, the designer modified the code of existing living species to produce new living species, or, two, on the other hand, the designer just created new living species out of either inanimate matter or --

A. I think at this stage both positions are legitimate.

Q. Do you have a personal preference as to which one is correct, a personal intuition or --

MR. WHITE: Objection as to relevancy as to his personal views.

THE WITNESS: I have a personal opinion. It is not -- I mean, it is evolving in and of itself.

BY MR. LUCHENITSER:

Q. Can you tell me what that is?

A. It's going to be a combination of both.

MR. WHITE: Hold on, I just want to understand. What are you asking him as an opinion,

as a scientist or just as a guy on the street?

MR. LUCHENITSER: Either as a scientist or a personal opinion.

BY MR. LUCHENITSER:

Q. Your personal opinion informed by your scientific knowledge.

A. Okay, so my personal opinion informed by my scientific background, is it -- it is going to fall out there is a combination of both. There will probably be organisms that appear that were designed as aboriginal forms that have diversified and evolved over time, okay?

Q. Are there any experiments or empirical studies that intelligent design theorists can do on the issue of how organisms appear, you know, how new organisms appear and develop?

A. Those are experiments that are ongoing in terms of the general scientific community. I mean, you can take microorganisms and grow them in continuous culture for months and years in generation times of 20 minutes, that from generational perspective can be the equivalent of hundreds of thousands of years and ask how much change do we see?

So those are experiments that are

pertinent to these questions in terms of change over time.

Q. So would those experiments be designed to observe action by an intelligent designer?

A. No, they are designed to look at the limits of genetic change under varying environmental conditions to model evolutionary theory or to provide data that can be interpreted from a design perspective.

Q. Are there any experiments or empirical studies that are possible on the question of how an intelligent designer acts when producing a new species?

MR. WHITE: Objection, asked and answered, and confusing.

THE WITNESS: Are you asking me are there experiments that will define where design is implicit in the appearance of --

BY MR. LUCHENITSER:

Q. No, the experiments – are there any experiments that are possible on the question of whether the designer acts either, one, by modifying the genetic code of an existing life form or, two, by just creating a new life form from scratch out of inanimate matter or design out of nothing?

A. No, I mean --

MR. WHITE: Objection, compound question.

THE WITNESS: Okay, I mean, putting it in this perspective, I mean, evolutionary science and intelligent design is a historical science in terms of -- I think I quoted in my expert report Ernst Mayer, who is one of the most prominent of all evolutionists, who just died recently, stated that "Laws and experiments are inappropriate for the explication of such events and processes. Instead one constructs a historical narrative consisting of a tentative reconstruction of the particular scenario that lead to the tentative events one is trying to explain."

So it is difficult when you ask me what experiments are going to go back and tell us what happened historically. You know, from both sides that's very difficult, and it is somewhat unique in terms of experimental science to the question of evolution. It is an historic inference looking at the record that we have.

Q. You say intelligent design theory is also a historical science?

A. In terms of looking at the past record of life on this planet and interpreting it as to a

model in terms of how life appeared and has diversified over time, yes.

Q. Is intelligent design theory capable of demonstrating how an organism was designed?

A. Is intelligent design capable of determining how an organism was designed?

Q. Right.

A. Not at this point. Neither is it true for any biologist at this point in time.

Q. Does intelligent design theory have any conclusions or opinions on which organisms were designed or what kinds of organisms were designed?

A. No, no.

Q. Do you have an opinion on that basis in your own scientific experience or knowledge?

A. No.

Q. Is there any way to I-D that intelligent design theory can distinguish between organisms that were designed and organisms that evolved?

A. Not empirically, but can you affirm. This is where genomic analysis is going to come in. At my level, the fact that different types of organisms, groups of organisms, the alpha proteobacteria from the beta proteobacteria which are within organisms within each group show

relationship, but there are differences between 20 to 30 percent novel DNA in all these major groups of bacteria. The question arises, where does that novelty come in.

Q. So does intelligent design theory contain any conclusions or assertions other than that neo-Darwinian theory doesn't adequately explain the development of life on earth and that an intelligent designer is responsible for the development of the life on earth?

A. Yes, I mean that's the basic principle, is that -- you know, my professional opinion, natural selection, time, laws of chemistry and physics are inadequate to explain life as we know it. It has all the hallmarks of design.

You look at the genetic code, it is the most sophisticated information storage system in the universe as digital readout. If it is truly an arbitrary code, then there is no reason why triplets for each amino acid have that specific designation, yet recent computer analysis shows that it is the optimum code of all potential theoretical codes that would be formed by random chance to negate the effect of point mutations, which I find astounding.

Of the millions of combinations of

triplets, you know, for the entire 20 amino acids that it is coding for, we find, by empirical analysis, that the genetic code is optimized to minimize the effects of base changes in that code.

Now, that causes me to pause and wonder. It causes my colleagues to pause and wonder how is nature so lucky on random chance? You know, that this frozen accident, Francis Crick refers to it as the genetic code, is mind boggling. So --

Q. Uh-huh. Let me just go back, though.

Do you have a scientific opinion on whether anything above complex molecular systems were designed? By that I mean, do you have a scientific opinion as to whether any complex animal species were designed as opposed to just the microscopic complex biological systems?

A. No, no. Again, it goes back to this question of where is the designer intervening in this process? And, you know, I don't know. I mean, that's speculation.

Q. Is there any kind of consensus in the intelligent design on that issue?

A. You have people from the entire spectrum from theistic evolutionists all the way up to six-day creationists. It is a pretty broad tent in

terms of people that ascribe to intelligent design.

Q. How old do you think the universe is?

A. Well, the current, you know, consensus was 20 billion years, although the COBE satellite experiment measurements have reduced that to about 12.5 billion years in terms of the age of universe. The earth, according to multiple scientific independent analyses, is somewhere around 4.5 billion years old.

Q. Do you accept those concepts?

A. Yes.

Q. Does intelligent design theory accept those beliefs about the age of the universe and the age of the earth?

A. There is not a set consensus, okay? Although I think it is a prominent position. But there are both. I mean, from the camp you have your old earthers and young earthers and both ascribing to a designer.

Q. So are there some scientists within the fields of intelligent design theory who believe that earth is less than 10,000 years old?

MR. WHITE: Objection, speculation, lack of relevancy.

THE WITNESS: Oh, I'm sure there are, you

know?

BY MR. LUCHENITSER:

Q. Again, I'll give another hypothetical. If students in the Dover School District were taught that the earth's history can compress into a framework of several thousand years, would they be misled about scientific knowledge?

A. It's inconsistent with the present body interpretation, okay?

Q. What is your belief on about how long ago life first appeared on earth?

A. Well, from the fossil record you have fossil bacteria that appear at 3.8 billion years, somewhere around that time period.

Q. And what is your opinion on how long ago the first multi-cellular animals on earth appeared?

A. I'm not a paleontologist, I don't know what the time frame is, but it's a significant period afterwards from the first appearance of prokaryotes.

Q. Do you have any opinion or knowledge as to how long ago the first land dwelling animals appeared on earth?

A. Again, that's changed, from my experience, over time, so I don't -- I don't fix a

specific time period. Again, it's not my area of expertise.

Q. Do you know what the consensus is in the field of paleontology on that?

A. I have read it, but I don't recall a specific number, but I don't have any problem with it.

Q. Would 450 million years ago sound right?

A. Sure.

Q. You don't have any reason to disagree with that consensus?

A. No.

MR. WHITE: I'll object to this line of questioning. He said this is all outside of his area of expertise.

BY MR. LUCHENITSER:

Q. Does intelligent design theory accept the general consensus among paleontologists as to the time line of the development of major kinds of life on earth?

A. I think you have a spectrum of people that are looking at that information. Some of them are constrained by their religious beliefs and, you know, there are scientific creationists within the intelligent design camp that wouldn't say that so

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they are looking at a young earth viewpoint. And there are other people that accept an old earth scenario, the sequential appearance of organisms in the geologic record.

Q. I think before we talked a little bit about the concept of a common ancestry or common decent, and let me try to define common ancestry or decent as not necessarily that life descended from one cell that appeared three or four billion years ago, but that all life today developed from one or a few microorganisms that existed several billion years ago. So let's put aside the question whether it was one or several or a bunch of different ones. Defined broadly in that sense, do you accept the concept of common ancestry or common decent?

A. I think it is highly speculative for anybody to make an assertion along those lines based on our knowledge, okay? This is looking at historically -- let me put it this way. The empirical science of nutrition can't figure out if butter or margarine is better for us, yet at the same time we make definitive statements that life arose from primitive ancestral organisms on this planet.

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It goes back to the question that I have covered before, what is the capacity to change for any organism? That's an unknown at this point. How did these first organisms appear? You know, what is the mechanism whereby natural law can produce a replicating organism? I mean, that again is an unknown quantity.

We know that the smallest free-living organisms on this planet, the micro plasma, have on the order of 300 to 350 genes, okay? So you've got to have at least that amount of information before you can replicate life that we know it at present. That's a lot of information required.

Now, is just natural phenomena sufficient to produce that? I'm unwilling to say. From my professional experience, no. Whether you have 10 organisms, a hundred organisms, primordial organisms appearing de novo, or one, I mean, you know, it is an event that is on the range of the miraculous, regardless of whether you still believe it is by natural process or a designer, okay?

So am I making myself clear?

Q. I'm not sure. It sounds like you are saying -- at least it's your personal opinion, based on the scientific understanding that you have, is

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that you would not accept the proposition of common ancestry or common decent as I have broadly defined it?

A. Okay, look at -- I am trying to think. I want to quote a couple of things from my report directly so it's in the record. From Carl Woese, who is a leading --

MR. WHITE: Just for me to clarify, are you talking Exhibit 1? You are quoting from page six; correct?

THE WITNESS: Yes, at the top of the page.

So this is in the peer-reviewed literature, this is a prominent evolutionary biologist, and looking at what you are talking about in terms of the origin of life.

He says, "The creation of the enormous amount of and degree of novelty needed to bring forth modern cells is by no means a matter of waving the usual wand of variation and selection. What was there, what proteins were there to vary in the beginning? Did all proteins evolve from one aboriginal protein to begin with? If you extrapolate that all organisms evolved from one single organism to begin with? Hardly likely!

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Evolution's rule, to which there are fortunately a few exceptions, is that you can't get there from here."

So the transitions required to go from simple organism complex, we know from experience you can't get there from here from our present understanding of these organisms.

"Our experience with variation and selection in the modern context does not begin to prepare us for understanding what happened when cellular evolution was in its early rough-and-tumble phases of spewing novelty."

So you are asking me an opinion on something that the leading evolutionists are at this point speculating on and agreeing that our present understanding of natural selection and variation in modern context doesn't prepare us for understanding what happened in the historic context, or historic events billions and billions of years ago.

If I can find it --

So to rephrase where we are, I mean, the question is dealing with common decent, okay?

Q. I'm trying to get past what happened several billion years ago. I'm trying to kind of say it in layman's terms of once the development of

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the life got going, once you got past the really simple microorganisms and once you start getting into more complex organisms, do you accept the proposition that all the complex organisms descended from one or a few more simple organisms that might have existed three billion years ago, or whenever? Or do you not even accept that?

A. My thinking on this is changing. As a graduate student, a post doc, I didn't really have a problem with that based on our knowledge. But now, again with genomics and what we are understanding in terms of our new understanding of the cell, genetics, the capacity to change, I am finding it harder.

There is one rule in design that biologists also ascribe to. The more complex an organism or the more complex the machine, the more difficult it is to change it, okay? You just don't throw DNA into a system and expect it to integrate with the program that is present. There are real problems with that.

So mechanistically from our present knowledge I have difficulty in terms of assuming that there is this gradual evolution of organisms from the simple to the complex.

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Q. And does intelligent design theory have an opinion as to whether these concepts of common decent or gradualism are valid?

A. Again, there are people on the spectrum. Mike Behe, in my conversations with him, has no problem with common decent from very primitive organisms to the complex. I am probably more distant from that position. I think that there is -- again, my opinion is that there is probably injection of design at various stages, but I don't know what those stages are.

Just to add to this, I mean, in my readings of Stephen Jay Gould, who is a paleontologist, Simon Conway Morris, is that the record, the fossil record of change, you know, is one of stasis, there is a lack of intermediate forms. We don't have, according to James Shapiro, who is a microbiologist at the University of Chicago, the phylogenetic history of any biochemical pathway for subcellular organelle.

We can't trace the flagellum back through its heritage phylogenetically. So you are asking me to speculate on, you know, at the organismal level is this possible based on our current understanding when we don't have the data to look at even

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components of the cell and their historical progression?

Q. Do you have an opinion as to whether humans and apes descended from a common ancestor?

A. It is possible, you know. The fact that you find 98 percent sequence identity is consistent with that viewpoint. The fact that you find 98 percent sequence homology is consistent with a common design.

Q. Do you have an opinion as to whether humans were specially designed?

A. Not scientifically. My personal opinion from a philosophical point of view, from a religious point of view, is that, yes, we are rational organisms that have the ability to think in an abstract sense, and that differentiates us from the rest of the biological forms on this planet, okay?

Now, whether we were the gradual descendant of other simians or specially created, I don't know. I do know that we are -- we have been endowed with certain capabilities that differentiate us from the rest of nature.

Q. Do you believe that natural selection can explain some aspects of biology?

A. Oh, for sure, no doubt.

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Q. Are there people within the intelligent design community who would disagree with that conclusion?

A. Not that I'm aware of.

Q. What aspects of biology do you think natural selection can explain it?

A. Oh, I mean, that's the routine tool that we use in the laboratory in terms of genetics and putting selective pressure on organisms and looking for modifications.

Q. Do you think that natural selection can explain micro evolution?

A. For sure, no problem.

Q. How would you -- or how do you distinguish between aspects of biology that natural selection can explain and those that it can't?

A. Again, it comes back to the question of what are the limits of change of an organism.

Q. Do you have an opinion whether natural selection and random mutation can produce new genes with new functions?

A. They can take existing information that can be modified to produce similar, and over time, some different properties. In other words, you can expose an organism to a man made compound that has

carbon and nitrogen that has a potential use for energy, okay, and cycling into other components of the cell.

It may be recalcitrant, you know, so it it has never appeared on earth before. There are organisms that aren't specifically capable of breaking down and utilizing that compound, but over time, if you put stress on the organism, you can develop, modify enzymatic pathways that will evolve and use and break open, say, a chlorinated biphenyl, or something like that. So I have no problem with that.

Q. How would you define science?

A. Science is the discipline of accumulating knowledge of the natural world.

Q. Are you familiar with the National Academy of Science's definition of scientific theory?

A. Yes.

Q. Would you know it off the top of your head?

A. I could paraphrase it. It would be a statement or a set of statements that explain a set of facts or phenomena through, you know, experimentation or observation.

Q. That seems pretty close to what I have down here, but I will just read you back what I have here, which I believe is the actual definition. It is a quote.

"A well substantiated explanation of some aspect of the natural world that can incorporate facts, laws, inferences, and tested hypotheses."

A. Sure.

Q. Do you accept that as a valid definition of a valid scientific theory?

A. Yes, I do.

Q. And under that definition does intelligent design qualify as a scientific theory?

A. Yes.

Q. I'm going to read you a definition from a Ken Miller's Biology Book of Science.

"First, science deals only with the natural world; second, scientists collect and organize information in a careful, orderly way, looking for patterns and connections between events; third, scientists propose explanations that can be tested by examining evidence."

Would you agree with that definition?

A. Sure, it's right out of his biology textbook. And in fact, you know, I was asked to

review a biology curriculum for a private Christian school and they had a -- I don't know where their curriculum was from, but it was creationist. I said, "Use Ken Miller's book, augment it with Pandas and People if you want a counter-argument. But I have no problem.

If you read further in that paragraph he says, "Theory are subject to change as new information is gathered and compared to the model of any theoretical explanation."

That's a history of science, is revolutions in thought. You accumulate more information or you look at it in light of new circumstances and you go back and you modify theories to be consistent with observed fact or experiments.

Q. Can you tell me what the difference is between a hypothesis and a scientific theory?

A. Well, they can be used interchangeably, and they are all the time from a working perspective.

I have a student that will come in and say, "Hey, I have a theory that this gene is participating in knocking out this function in a white blood cell." Fine. You know, that's really a

hypothesis.

A hypothesis is an idea that predicts certain outcomes that are testable experimentally, all right? Then once you carry out the experiment or a set of experiments, is it consistent with your original hypothesis? So it can be something as simple as an idea or a conjecture. First, as a theory, which is more formally, you know -- and according to the National Academy is based on well documented experimental evidence that has been accumulated over time and subject to experimental verification.

Q. And then it is your opinion that intelligent design is a scientific theory; is that correct?

A. Yes.

Q. And with reference to the National Academy of Science's definition, can you explain how intelligent design satisfies that definition? Maybe we should go by the components of the definition.

The first component is a well substantiated explanation. Can you explain how intelligent design theory can be considered a well substantiated explanation?

A. Looking at the public evidence, okay, in

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terms of the natural record, can you explain it based on inference to an intelligent designer? It is a new theory and it is going to be modified over time, and this is the way science works.

Let me give you an example. Until the 1930s the consensus viewpoint in science was that we had a static universe, okay? And then Einstein comes up with his equations and relativity and is bothered by the fact that when you run these equations through, it looks like the universe had a point in time and history where it began.

Now, this was contrary to the accepted consensus view of all scientists at the time period and he didn't like the implications, from my understanding of historical science, because of the metaphysics.

Then you have independent observations of Hubbell and other astrophysicists that show you have red shifts, you have got galaxies that appear to be moving away, and you have a real monumental change in our understanding of the universe in terms of what was accepted theoretically. And then as new data came in, it took time, it took argument, it took reformulating how we could do experiments to address this inference based on a minimal set of

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data. But it changed our view of the universe, okay?

And in the same way I think we are at the stages where we are looking at the natural record and saying, based on inference, well substantiated records from paleontology, from molecular biology, from biochemistry, from genetics, that there is a limitation to our current theory of natural selection; that we infer intelligence. And that's going to contribute to biological systems.

It will have an impact. Just because Einstein had a metaphysical problem with the predictions of his equations, and he even modified those equations to remove the fact that the universe had a point in time beginning in history, I think impeded thought, okay?

And this is a question that I have in terms of our present state of biology. Intelligent design has been characterized as a religious position, a non-scientific position, because it goes against the current consensus.

Now, I think as a scientist there are legitimate claims, legitimate questions, legitimate criticisms that we are bringing out on the table and have to be addressed by our current

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understanding of neo-Darwinism. We are being marginalized as a non-scientific approach just as people had problems with Einstein's predictions or Hubbell's predictions because of the metaphysical implications of how we viewed the universe and our position in it.

People object to my position because of the same -- for the same reasons. Nonetheless, the data will drive us in that direction, the science will drive us in that direction. We may be wrong, okay? We are going to have to stand the test of criticism and the dialogue and, you know, we may be wrong, that's a possibility. But I think our model is consistent with the public evidence.

Another critical aspect to this debate is that if the other side is wrong in part, and I'm not saying that they are wrong in total, but in part, if there are positions that neo-Darwinism draws or inferences that it draws that are incorrect, that could have an impeding effect on the advancement of science, just like Einstein's reluctance to accept that there was a point time start in the universe.

That opened up entire new vistas in terms of looking at the universe if it proposed at that point unforeseen experiments that could be done to

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verify it.

So are you getting my point? You are asking me, is intelligent design based on the National Academy of Science's definition of a theory based on a well substantiated explanation. We are at an infancy at this point. It is controversial, it is heretical based on the common consensus. But that's the history of science. Whenever you have a new interpretation it is going to be fought in the public arena.

Q. You say it's in its infancy, how do you -- what is the basis for saying it has risen above all of the hypotheses and up to the level of a scientific theory?

A. Because we are looking at the natural world and we are seeing information storage systems, coded systems that in any other context we would ascribe an intelligence behind it. You look at the genetic code -- I mentioned Bill Gates is envious of the ability, you know, the mechanism whereby that information is stored. It's the most efficient storage system in the universe. It has true characters by which information is extracted from it. It's not unlike an alphabet, it's not unlike a musical scale, it's not unlike mathematical symbols,

okay? It's a true code.

Our experience tells us whenever we find a code there is a coder. In the same context, we look at subcellular machines, a new view of our understanding of the cell that is within the last 40 years. We didn't know about the bacterial flagellum and how sophisticated it was, we didn't know about DNA replication and their profound efficiency and editing functions.

We have to look at this new data and say is natural selection up to the task to produce this level of complexity and specification?

Put it this way, on the Genome To Life web site that was produced by the Department of Energy several years ago, they make the statement in the introduction that is to be read by the public that, "The molecular machines we find in the simplest of organisms produced by evolution dwarf the engineering feats of the twentieth century."

Natural laws, undirected, unintelligent, un-in-purpose, un-forward looking can produce machines more sophisticated than the entire community of intelligent design engineers.

(Off the record.)

MR. WHITE: He was going to finish his

answer from before.

MR. LUCHENITSER: I'm comfortable with the answer, I don't need anything more on that.

THE WITNESS: The last bit of the sentence. So I'll continue with the statement, "The molecular machines in even the simplest of organisms produced by evolution dwarf the sophistication and subtlety of machines produced by man, essentially. I mean, that's a paraphrase.

BY MR. LUCHENITSER:

Q. Does the science only consider natural causes?

A. Not necessarily, okay? You always look for natural explanations first. I mean, that is consistent. But I mean, there are sciences that look for signs of intelligence, whether it is the SETI project, if you are a forensic scientist, if you are an archeologist, you know? You are looking at natural products and asking is there an intelligence involved in what you are seeing.

Q. Does science ever consider supernatural causes?

A. Under our current definition of science, natural methodological science excludes supernatural, but that hasn't been the case

historically.

Q. Is the idea that science doesn't consider supernatural causes as methodological naturalism an accurate term for that concept?

A. Right, if you are only going to -- if you are going to define science as only accepting natural cause and event to explain the phenomenon you are studying, fine, if that's your definition of science. It may not be the reality or the truth of the situation.

Q. Do you disagree with the current definition of science that does not -- that's too many negatives.

I think you agree that the current definition of science does not consider supernatural causes. Do you disagree that that should be the correct definition?

A. It's a qualified disagreement, especially in this debate. If the science is pointing you to an intelligent cause, then you have to go where the data leads. If you are limiting your interpretation, your interpretations, or what you will accept as interpretations, it has consequences.

And I'm the first person to say we look for natural causes, natural explanations first, all

right? But I'm not opposed to looking at the data any more than a forensic pathologist is and saying, you know, is it a natural death or was this a designed death, is this a murder?

Is natural law sufficient to describe life forms on this planet or not? It's a valid question. If it is insufficient, then that implies that there may be an intelligence behind it, or in a definitional term, a supernatural cause. But I'm not saying supernatural in the way that you would imply superstition or a specific god, et cetera. It is just above the natural explanation.

Q. Would you agree with the proposition that in order for intelligent design theory to be considered valid science, science has to go beyond the concept of methodological naturalism?

A. It would have to be modified. But again, this is an artificial definition, in my mind. If you are only going to accept natural explanations, then that's all you are going to see, because by definition you aren't even going to allow any other explanation into the conversation.

Q. So in order for intelligent design theory to be valid science, does the definition of science have to be broad enough so that science can consider

supernatural causes'?
A. Right, I mean, isn't that what is going on in NASA when you have all these radio telescopes pointed out in the universe and asking the pattern of pulsar magnetic radiation, different types of radiation coming at us? Is it all just natural, or is there somebody out there that has intelligence that is trying to communicate with us?
I mean, that is going beyond, that is looking at the natural data and saying, "Is there an intelligence behind it?" That is legitimate. You are looking for patterns, you are looking for specificity, and it is being used now as part of our scientific methodology.
Q. But there you are talking about looking for extraterrestrial life, so it still seems that you are looking at natural actors as opposed to the supernatural actor. Now with respect to intelligent design theory, doesn't --
A. Intelligent design theory doesn't rule out the fact that those natural actors may have a super intelligence that participated in development of life on this planet, okay? And we don't know that they exist so it is supernatural to our experience. We don't know that there are aliens out

there. We don't rule them out, we don't know they haven't visited this planet. So that is, by definition, supernatural, and there are a lot of scientists that agree.
Francis Crick looked at the common evidence in biology and said life could not arise on this planet de novo, it was seeded by some extraterrestrial source, in formulating his theory of Pan Spermia, all right? Nobel laureate, looking at the evidence, saying that there is some supernatural event in terms of our understanding of natural events on this planet, that solar winds blew in some primitive organism or someone visited this planet and seeded life. I mean, that's pretty far out, but it is one of the hypotheses.
Q. Let me draw your attention to the top of page 10 of your report, all the way to the top. You say, "The real problem may not be determining the best explanation of the origin of the flagellum. Rather it may be amending the methodological strictures that prevent consideration of the most natural and rational conclusion."
Can you tell me what you meant by amending the methodological strictures?
A. In other words, it is limiting our

interpretation of natural phenomena. It has consequences. If you are only going to accept the laws of physics and chemistry, time and chance, as an explanation of life on this planet, how it arose, how it diversified, that could have -- that could be a methodological stricture that has consequences in terms of the progress of science.
Going back to Einstein's experience, he came up with a radical new interpretation of the universe that had philosophical, religious, metaphysical implications. Whatever you want to call it, he didn't like it, all right? And he essentially fudged his equations to eliminate that interpretation that impeded science.
All I'm saying is that I think in biological systems we infer, in a consensus viewpoint, that natural cause and effect is sufficient to explain what we see, and I disagree with that. It has the same types of implications that were faced by the big bang theory, and that's a legitimate area of exploration scientifically.
Q. On page one you say, kind of in the middle of the last full paragraph on the page, you refer to neo-Darwinism as the generally accepted mechanism. So you would agree that evolution is a

generally accepted theory in the scientific community?
A. Sure.
Q. Would you agree that intelligent design theory is not generally accepted by the scientific community?
Q. Oh, I agree, I agree. Like I said, it is a minority opinion; in some people's minds it is heretical, okay? But again, you can look at the history of science and that's how we progress, by challenging the status quo and holding it up to, you know, an explanatory filter that has got to be consistent with the information as we see it.
I think it is legitimate debate. That's why we are here. I respect Ken Miller and he is serving a purpose in this debate, you know? He is -- and I am all for it. I enjoy the interaction that we have had in a limited sense.
That's how science works. You have areas of contention that can be small, they can be large with cosmological implications. But that's how we progress, by keeping each other honest.
Q. In your report, again I've quoted -- and this is before the beginning of the last paragraph on page one, you state that, "Intelligent design

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theory holds that the deep complexity and clearly evident design in organisms is the result of an intelligent agent."

Do you consider that to be a testable proposition?

A. It is as testable as evolutionary theory. Again, it we are looking at – you know, it is an historical science in one aspect. We are going back and looking at the records, we are looking at our present knowledge and seeing if it is consistent with the model that we currently have. This is as much testable as evolution.

Let me give you an example. One of the evidences for neo-Darwinism is molecular and structural homology, okay? You look at the skeleton in my hand, you look at the skeleton of a bat wing, you look at the skeleton of a whale fin, there is similarity: Same bones, different size structure.

I have a problem in the sense, though, that it is a self-referential argument. I believe in common decent and therefore organisms should have homologies, and because I find homologies, it therefore proves common decent.

It doesn't rule out common design, in my mind. Common design is on the table and you would

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make the same predictions.

Q. Do those various kinds of examples you just gave, do these homologist structures -- do they have identical genetic codes?

A. Some of them do, some of them don't. And that's another interesting point that Simon Conway Morris brings up in his paper that is included in mine. If you believe in common decent, you would think that organisms that have the same body plan would develop through the same genetic program.

So there are, to my understanding, invertebrates, such as sea stars, that go through intermediate larval stages that are vastly different. In fact, they weren't even recognized as similar organisms when they are looked at at the larval stage, yet they end up with the same body plan.

Morris says it looks like evolution is somehow channeled, and that is a problem with an evolutionary scientist in terms of genetics and the phenotype. And if it is channeled, then teleology, purpose, is back on the table.

That's the prominent -- one of the most prominent evolutionary biologists stating and citing an intelligent design by Denton saying that this is

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a legitimate explanation.

Q. Now, let's go to the -- I guess there are bird wings and bat wings as kind of an example in a homologous sense. What was the example you were just using a second ago?

A. In terms of human skeletal structure for a hand and a bat wing and a whale fin. I mean, they have got similar structures, and therefore you infer that they are related by decent because of homologies at the structural level.

Q. Does a scientific theory have to be testable?

A. Again, in terms of evolution, and Ernst Mayer's definition, "Laws and experiments are inappropriate for the explication of events and processes when we are dealing with evolution."

We are looking at historical records. There are certain aspect that can be testable, but again, there is a lot of inferences and extrapolations that are involved in our current thinking.

Q. Is it generally accepted in the scientific community that for something to be a scientific theory it has to be testable?

A. It has to be consistent with a body of

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knowledge that explains the phenomenon or the facts that you are addressing.

Q. Is it not the case that there has to be a way to test this?

A. There are examples. I mean, Kurt Goedell said that there statements that are true that are unverifiable, you know? And that's a conundrum.

Q. What are some examples of statements that are scientifically --

A. I'm not a mathematician and he is a mathematician. But, you know, I would refer you to -- go to Fischer Bach, you know a popular treatise on this phenomenon.

Q. Does scientific theory have to be falsifiable to be a valid scientific theory?

A. It is a component that should be incorporated, yes.

Q. Is there any way to falsify intelligent design theory? Is there any way to falsify that?

A. You bet, you come up with a phylogenetic history of some of these things that are up in contention and, you know, where you can get genetic information de novo, in a real experiment, not an artificially simulated experiment, and we are going to check.

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There is a potential that, hey, there is -- the evidence could be overwhelming and we are going to throw the towel in and go home. You bet.

The same has to be held on the other side as well. And there are certain concepts of evolutionary theory that I think are unfalsifiable in terms of -- some people, even within the scientific community, have the old adage that a theory that explains everything, explains nothing, okay?

If you look at the bacterial flagellum, Mike Behe says that it is irreducibly complex, we don't have intermediates. He says you need two microorganisms. We don't have the intermediate stages of the phylogenetic history of that.

Yet my colleagues, as evolutionists, assume without fact that these are all present, the intermediates, or some presence, is responsible for the appearance of this structure, you know? By definition, because they are only going to accept the natural law, but is that falsifiable?

Q. Have you conducted any experiments to demonstrate the validity of intelligent design theory?

A. I think the body of my peer-reviewed

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publications are consistent with an intelligent design interpretation. Again, this isn't -- it is not the accepted interpretation, but I think they are consistent.

Some of the experiments that I mentioned, both done by other researchers and experiments we have initiated looking at antibiotic resistance, are consistent with some aspects of intelligent design or consistent with what we refer to as the limitations of evolutionary theory.

Q. These experiments you have conducted you say are consistent, but they don't conclusively prove that intelligent design theory is accurate --

A. They are scientific -- they are scientific --

Q. -- or that --

A. -- sorry, I didn't mean to interrupt.

They are scientific conclusions based upon the work that, through my interpretation, are counter to, say, a neo-Darwinist. That's where Ken Miller and I come in, we are both looking at the flagellum, we are both asking, can natural selection produce it? We are looking at type III secretory systems. This is what I work on specifically in my research, and whether or not these are true

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intermediate structures to bacterial flagellum.

I was willing to concede that they weren't. In fact, when Mike Behe first published his book, I called him up and said, "Whoa," you know, "we are working on stuff that may be a problem here when you are using this as an example."

Over time, as more work has been done by my lab and other labs, I am unwilling to say that the type III secretory system is an intermediate structure for the bacterial flagellum. But the point is, we are both scientists, we are both looking at the common evidence, we are both drawing conclusions based on that evidence. And my conclusion is that this is a highly efficient machine that has all the hallmarks of a design product, and he says natural law is sufficient to explain it, okay? That's a legitimate argument and I don't see why there is a problem with it.

Q. If scientists were to demonstrate how natural selection could have produced the flagellum, would that, in your mind, falsify intelligent design theory?

A. If you can show me the intermediate structures in the phylogenetic history, yes, but in a sense that to me is unfalsifiable because I don't

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think we have them. It is going to be inferred and -- listen, we all have biases that we bring to the table, you know? And how we are going to interpret things. Mark Twain is quoted as saying, "Don't believe your eyes when your imagination is out of focus."

You know, we have got a set body of evidence that has been filtered through an allowable set of parameters and new ways of thinking about it are a problem to get through that filter.

Q. Just a second ago you said in some sense it is unfalsifiable, can you explain what you meant? Did you mean there is no way to actually --

A. No, I think there is, but I am going to be --

MR. WHITE: Just don't over-speak him, because the court reporter can't get everything.

THE WITNESS: Okay, all right.

It is going to be -- it's going to be difficult. I think, yes, there is -- my view is falsifiable.

BY MR. LUCHENITSER:

Q. It is falsifiable?

A. Right, for sure. In other words, if you can come up with a mechanism that can produce these

macromolecular machines, you know, then okay.
Q. Would you be satisfied by just the demonstration of how the flagellum is produced or would you want a demonstration of how a bunch of different macromolecular flagellum were produced by natural selection?
MR. WHITE: Objection, a compound question. The reason I say that, there are two parts to it which advance both questions.
THE WITNESS: Right, is one body of evidence sufficient or does it require multiple?
You know, it's a speculative hypothetical question. I want to see the data before I make an assessment.
But going back to your original question, yes, I think it is falsifiable.
Q. A lot of what we talked about is kind of the pace of development of major kinds of life on earth, and I think it is correct that the general consensus is that about four billion years ago first life appeared and complex multi-cellular life might have appeared about 600 million years ago, and then multi-cellular land animals might have appeared 450 million years ago. Would you kind of agree with the proposition that the pace of development of more and

more complex life has accelerated throughout the history of earth? Is that something you generally see as correct based on the --
A. I don't know if I would say accelerated. The appearance of organisms in the fossil record have expanded in terms of their complexity over time.
Q. Does that pace of development -- does that support intelligent design theory or does support the scientific theory of evolution?
A. It could be interpreted either way.
Q. Can you explain how it could support intelligent design theory?
A. Well, you have an intelligent agent that could be introducing new life forms at specific points in history.
Q. Do you have any idea why it would take the intelligent agent several billion years to go from the simple microscopic life forms to a more complex animal species?
A. That's a speculative question, it's like asking why did Beethoven write the Ninth Symphony last instead of first. It's a created object. If intelligent design designed an object, it is a creative process, and I'm not going to speculate on

the motives of any designer.
Q. Does the intelligent design theory have any answer to that question?
A. No.
Q. Do we have any evidence of any extraterrestrial life in the universe?
A. Not at this point.
Q. Does the intelligent design theory have any opinion as to whether the universe is finite or infinite?
A. I think it subscribes to the current cosmological understanding of the universe in terms of it is expanding and there was a point in time where it began. I mean, infinite --
Q. Is it infinite in size or finite? Is there a consensus --
A. That's outside of my expertise.
Q. Now, one way to characterize -- or an argument made by intelligent design proponents is that there is an extremely low probability that the living beings we see on earth could have arisen through natural causes?
A. For sure, right.
Q. Now, do we have any evidence at all as to how frequently life in the universe arises, what the

actual frequency of living beings -- complex living beings arise in the universe on any given planet?
A. Again, that's outside of my expertise. I mean, I know the Drake equation predicts that there are multiple planets that could support life. There is a group at the University of Washington that has published a book recently called Rare Earth, which Guermo Gonzalez was part of that group who is an intelligent design advocate who had an article on the cover of Scientific American several years ago expounding this view of rare earth hypothesis, that the Drake equation may be wrong in terms of predicting the number of potential planets that could support life.
Q. We don't have any actual empirical evidence on how frequently life actually arises in the universe?
A. There are conjectures, from my understanding, but that is outside of my expertise.
Q. Now, even if one were to accept the proposition that the probability of life arising on earth and developing to its present state through natural causes is incredibly low without other evidence of -- without empirical evidence of how frequently life arises in the universe, how does the

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first proposition support intelligent design?
A. Rephrase the question so I understand what you are asking. In other words, you are talking about probability, low probability for life arising spontaneously in terms of the -- what would we say, the probabilistic resources in the universe, is it consistent?
Q. Let me try to rephrase it.
Okay, you take a proposition that the probability of life arising on earth is an extremely small number. Without any evidence that life in the universe, in fact on any given planet, arises more often is a probability number, what is the -- how can you conclude that the low probability indicates that life in fact was intelligent design and didn't just in fact originate through natural causes?
A. I mean, that's a complicated question. I am going to reply and clarify in my response, if I am addressing the question you are asking.
But does it --
MR. WHITE: If you don't understand the question --
THE WITNESS: I think I understand it, but I'm not sure. In other words, if there is an assigned probability to any event, no matter how

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small it is, given the size of the universe and the time involved, is that sufficient for that extremely rare event to occur? In other words, are the probabilistic resources available for events in the order of 10 to the minus 128 to happen?
MR. WHITE: Is that you are asking, Alex?
BY MR. LUCHENITSER:
Q. You can go ahead and answer the question the way you've understood it.
MR. WHITE: Object to the question that it is complex and confusing.
THE WITNESS: I will put it this way. I think it is recognized that life arising by natural cause on this planet is an extremely rare event. From our current knowledge, it is a singular event. It doesn't rule out that it hasn't happened somewhere else in the universe, but from our understanding that is speculative, okay?
Because of that extreme low probability, I think there are efforts in the scientific community to expand the probabilistic resources. The age of the universe is 20 billion years old, maybe 12.5, somewhere in there. The age of the earth is 4.5 billion years. The first life arose at 3.8 billion years. So you have got a time window

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that has got to account for the generation of the first organisms.
That's in terms of what we know and the probabilities that have been assigned these vary tremendously. A narrow window of time, regardless, everybody agrees. To expand that probabilistic resources available to us, there are people that are proposing there is a fourth law of thermodynamics to get around this problem that there is some organizing principle that can account for generation of information and formation of replicators, or there are infinite universes so that even though it is an extremely low probability in this universe, if there are an infinite number of universes and there is any probability for something to happen, it will happen at some time. It happened here, deal with it, okay?
But these are speculative. But I think they in part are addressing the problem of this low probability event of life arising.
BY MR. LUCHENITSER:
Q. So how do we get from the low probability to the conclusion of intelligent design if these alternative explanations which have not been refuted or falsified are still available? In an infinite

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number of universes, then as far as we know this may be the only planet in the numerous universes that even has life, how do you get to intelligent design? COURT REPORTER: You have to speak up.
MR. LUCHENITSER: I'm sorry --
MR. WHITE: Will you repeat that? I didn't hear most of it.
BY MR. LUCHENITSER:
Q. It was without having evidence of extraterrestrial life, how do you get to intelligent design? The only data point you have is the earth and life on earth and you have no evidence of life elsewhere and all you have is the low probability of life on earth, how can you get to the conclusion of intelligent design?
MR. WHITE: Object, it's an unintelligible question.
THE WITNESS: I understand what you are saying, but, you know, that's speculation. To me it's outside of my expertise.
But what it could imply that would be consistent with intelligent design is that the universe is a created phenomenon; that the designer could be outside of the universe and the author of

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these laws whereby the universe acts.
BY MR. LUCHENITSER:
Q. Let me switch gears here.
Before you spoke of your experience from where you used to be an atheist or agnostic and then you became a Christian. Can you tell me what denomination you ascribe to?
A. I'm not a member of any church or denomination.
Q. Do you attend any church?
A. I do.
Q. Is it an evangelical church?
A. I think it could probably be defined as evangelical.
Q. And would you consider yourself an evangelical Christian?
A. Evangelical in the sense that a Christian is directed to account for their beliefs in the public arena.
MR. WHITE: I will object to all these questions as irrelevant.
BY MR. LUCHENITSER:
Q. Does neo-Darwinian evolutionary theory conflict with your personal religious beliefs?
MR. WHITE: Object as to relevance.

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THE WITNESS: Parts of it, I think. Let me give you an example.
I am very sensitive to the difference between a lectern and a pulpit. I teach in a public university, I respect my students. What I hold as personal belief I don't present to students as part of the scientific knowledge that I am imparting to them.
Now, if they ask me personal opinions, I will say, "I have an opinion, we can talk about it outside of class," and it impacts on these philosophical questions. But I don't look at it as my responsibility to give my world view to anybody unless I am asked.
Contrast to that, I can give you numerous examples on this campus this year where my colleagues have stood up in front of a class and said, "No true scientist believes in a creator," making absolute statements that are loaded metaphysically.
We had a situation where there was an instructor hired by this department by an evolutionist to teach her class because she was buying her teaching requirement out with grant money, and she hired a creationist.

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There were people that objected on this campus that said, "Under no circumstances should a creationist be allowed to teach a biology class in a public institution." Okay? To me that's viewpoint discrimination.
So I am very cognizant of where my personal beliefs lie and the responsibility I have to make them known if I am teaching a course to my students. I don't find the same rules being applied to my colleagues.
Q. Let me ask you, at the top of page 10 of your report, I guess you are quoting your pre-year 2004 paper, you say, "Rather it may be amending the methodological strictures that prevent consideration of most natural and rational conclusion" --
MR. WHITE: Hold on a second, we've lost the page.
THE WITNESS: Right here.
MR. WHITE: Are we talking about Exhibit 1 here? Page 10.
BY MR. LUCHENITSER:
Q. "The most natural and rational conclusion, albeit one with discomfiting philosophical implications." And what is the conclusion you are referring to there?

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A. There is a designer.
Q. What are the discomfiting philosophical implications?
A. You know, that that has metaphysical implications in terms of how you conduct yourself.
Let me give you an example from my own personal experience. Now I have colleagues that I am very good friends with in my department and they know where I stand on this and they disagree with me, okay? And in our conversations I will ask them, okay, "Do you agree that nature has the appearance of design?"
They say, "Yes."
"Are you willing to consider that it may be real design or do you just think it is apparent design, as does Dawkins?"
"Well, it's apparent. We can explain it by evolution and natural selection."
Okay. But they know the problems of evolution because we are all molecular biologists and we know the complexity and specification that we are dealing with.
I will ask the question, "But don't you think this is a legitimate question?"
And they say, "Yeah, okay."

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"Then why are you so against my position of even considering that there is a designer?"

The almost unanimous response to that question is generally two fold: "If there is a designer, I don't want to know who he is because there is so much evil in the universe," or, "if there is a designer I don't want to know who they are," because, you know, him or she or it is, "because it has implications in how I lead my life."

And I can say to them, "Fine, I can respect your opinion. But recognize that your difference with me in addressing these questions is not scientific, it is metaphysical, you have a philosophical -- you have a religious problem with the implications, the discomfiting philosophical implications of my position and you dismiss them on that basis, not totally on the scientific argument."

And they agree. They will stop and say, "Okay, you are right."

Q. Let me ask you about the bacterium that causes the bubonic plague, is that called the Yersinia pestis bacterium?

A. Yes.

Q. And is it your opinion that this plague bacterium was designed?

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A. That's a loaded question, in the sense that if I am going to be consistent with ascribing the flagellum to a designer with inference to design, that it is a beautiful rotary engine, and I find it to be an irreducibly complex machine, this nano syringe, that is the most deadly molecular machine that we know of. I mean all gram-negative organisms have them. The Yersinia pestis alone has killed over 200 million people, it is going to be designed, too, okay?

So you have the problem of theodicy of evil, is the designer the author of evil as well as good design and bad design? That's a philosophical problem.

What I find interesting, however, is that there is a paper in the proceedings of the National Academy of Sciences this past year that compared the genomic sequence of Yersinia pestis with a closely related organism Yersinia CitA tuberculosis. So they are like 99 percent similar at the DNA level. In fact, the differentiation into different species is arbitrary, one is probably a sub species of the other.

No, Yersinia cito tuberculosis is a mild pathogen, it doesn't kill anybody, it will make you

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sick, it is food borne. It is like getting salmonella or pathogenic E. coli, you know? It's a double-bucket disease. You are going to be uncomfortable for a few days, but it's not going to kill you.

Compared to Yersinia pestis, that is in the major leagues in terms of slate-wipers in disease. 200 million people is nothing to blink at.

The primary difference between these organisms is loss of information, over 13 percent of the chromosome of Yersinia pestis compared to Yersinia tuberculosis. It is due to mutations, loss of information.

That to me is amazing. It is amazing to me that for my field, in molecular pathogenesis, all virulence factors, toxins, anti-host factors, are all mobile genetic elements. They are out of context. They have been acquired through introduction of a plasma through a virus, through a transposon. They are not part of the aboriginal design of the organism, they are not necessary for the existence of that organism.

So although it is early, you know – you can see genetic change in these organisms, it doesn't look like it was necessarily part of the

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aboriginal design.

That is a loaded, you know, interesting philosophical observation that deals with the question of whether you are going to hold the designer responsible for evil.

And this is an age-old problem. This plagued Darwin, from my understanding, that in part what is motivating him to, you know, be looking at an alternative explanation for life as the natural evil that he sees.

He talks about a dipteran wasp laying its eggs into a worm and that these eggs, when they develop, eat the worm from the inside out. I mean, that is pretty raw.

So the problem of evil is recognized, and it has been recognized for centuries. There are explanations that I think are consist. I'm not a theologian, I'm not a philosopher, but these are dealt with -- I wouldn't deal with them in a scientific context.

So you see what I am saying? So I think I understand where you are going in terms of --

Q. Do you have an explanation of these, I guess, evil designs from the perspective of intelligent design theory?

A. Well, I mean, we are going to have to deal with them, and they are interesting questions. But again, that's more of a philosophical outgrowth of intelligent design theory. All people, I think, regardless have this -- you can be like Dawkins who says evil is really just a perception from our perspective as humans, we expect to see it from a materialistic view point. There is no real evil. That's a human invention.

Q. Do you have a personal opinion as to why these apparently evil bacterium were designed or appeared?

MR. WHITE: Objection, relevancy.

THE WITNESS: Yes, I mean, it is totally conjecture and it is something that I am formulating now and I don't want to be quoted on it because I am changing. My ideas, as I think about these, are evolving, so I don't have a set answer for that. But I recognize it as a legitimate question.

BY MR. LUCHENITSER:

Q. Is it correct that you are the faculty advisor for Campus Crusade for Christ at the University of Idaho?

A. I am.

MR. LUCHENITSER: Let's mark this as

Exhibit 2.

(Deposition Exhibit No. 2 marked for identification.)

BY MR. LUCHENITSER:

Q. Can you tell me what Campus Crusade for Christ is?

A. It's a student organization of Christians.

Q. If you could, please, we have marked as Exhibit 2 a document called Student Organizations, Campus Crusade for Christ. If you could flip through the last page of Exhibit 2 where it says, "About the crusade." Let me ask you to -- let's focus on the second paragraph of that page. It says--

MR. WHITE: Just a general objection to no foundation showing authenticity.

BY MR. LUCHENITSER:

Q. Okay, it says under About Crusade, "Working together with those fellow believers, our goal is to help give every man, woman and child in the entire world an opportunity to find new life in Jesus Christ. Our commitment is based on the Lord's command:

"All authority has been given to me in

heaven and on earth. Go therefore and make disciples of all the nations baptizing them in the name of the Father and the Son and the Holy Spirit, teaching them to observe all that I command of you and lo, I am with you always, even to the end of the age."

Do you agree with that goal of the Campus Crusade for Christ?

A. I haven't seen this document before. But as a Christian, it is part of the tenant of my faith.

Q. Do you perform your work related to intelligent design theory in order to advance that goal?

A. No.

Q. Does your work relating to intelligent design theory in any way relate to that goal?

A. It is consistent with it in terms of an explanation of world views. But again, I don't feel it is my responsibility in the classroom to make those views evident. I don't preach this to students, I don't require a common belief in my laboratory as a requisite for any student that I am working with. I respect their individual beliefs.

I am very cognizant of this power

differential that I have with my students. So if you are asking, do I evangelize students in my laboratory and in my classrooms? I do not, unless I am specifically asked my view point, then I offer it as my opinion.

Q. Do you give speeches or presentations about intelligent design?

A. I do.

Q. And about how many of those speeches and presentations have you given?

A. I don't --

MR. WHITE: Object, time frame.

BY MR. LUCHENITSER:

Q. Ever.

A. I don't have an accurate record. I would say it is probably less than 15 over the last 10 years.

Q. About how often do you give these speeches and presentations?

A. It varies, you know. If you averaged it out, maybe once every six months.

Q. And have most of the speeches or presentations you have given about intelligent design theory been presented either at religious institutions or at programs sponsored or organized

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by religious institutions?
A. It has been a combination of both. I mean, at Calvin College I participated in a symposium there that was design and its critics, and there were people from all sides of this issue for and against, I mean, looking at a lot of these issues that we have raised.
Q. Would you say most of the presentations you have given about intelligent design have been at programs sponsored by religious institutions or most of them, or would that not be the case? Or is it about half and half?
A. I don't know. I mean, like I said, I don't keep track of that.
Q. Did you give a presentation about intelligent design theory at a retreat sponsored by the Evangelical Free Church of Pullman on or about April 1st of this year?
A. I did.
MR. LUCHENITSER: Let me ask you some questions about an exhibit relating to this presentation. This is going to be Exhibit 3.
(Deposition Exhibit No. 3 marked for identification.)
BY MR. LUCHENITSER:

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Q. What has been marked as Exhibit 3 is a document entitled Church Events, Creation Testifies to Her Creator. Would you agree with the statement, the bold statement right below the photograph?
MR. WHITE: Just a general objection to lack of foundation and authenticity on this document.
BY MR. LUCHENITSER:
Q. Would you agree with the statement: "God's word teaches us that the heavens declare the glory of God," "And they do"?
A. I didn't write it. I am not even sure who wrote it. The quote I agree with. I don't really have a problem with it.
Q. And would you agree with the next paragraph which says, "From her witness alone, creation teaches us about God's eternity, His power, and His God-qualities, which set Him apart from all created things"?
A. Where is this?
Q. This is right below that, it's the first paragraph of the text that says, "Creation teaches us that people are absolutely left without excuse for not recognizing God"?
A. It's right out of Romans 1, Verse 18.

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Q. So you would agree with that?
A. I think --
MR. WHITE: Objection as to relevance.
THE WITNESS: Right, I mean, this is in the context of a religious meeting and these are religious views that I think are consistent but not implicit in the intelligent design
Position. In other words, if I were asked to give a talk on intelligent design at this university, I'm not going to bring in biblical positions. I think the evidence stands on its own.
BY MR. LUCHENITSER:
Q. Let me ask you if you agree with the next paragraph. I'll try to read it quickly.
"Secular materialism has permeated our American culture under the guise of science through the vehicle of evolution. Evolutionary Theory, or Darwinism, has too long been a stumbling block for some when the opportunity for faith arose. It has produced that cloud of doubt leading some to leave the faith and hindered others from sharing the faith more vigorously."
Is that a statement you would agree with?
A. No, I didn't write it and I wasn't part of this advertisement.

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MR. WHITE: Just the same objections I have made, including hearsay.
MR. LUCHENITSER: did you want to make a standing objection to all these kinds of questions?
MR. WHITE: Yes.
BY MR. LUCHENITSER:
Q. Would you agree or disagree with the statement that, "Evolutionary Theory destructively impacts us," including because, "It reaches into our courts of law and ousts the Creator's laws"?
A. Not to the degree that that is stated. I would look at that as inflammatory.
Q. To what degree would you not agree with it?
A. I say that Darwinism, materialism has implications as a world view in terms of how we conduct ourselves individually and as a society, and some of it negative, some of it positive, okay?
I'd like to clarify that, too, in terms of my participation in this event. You know, I essentially covered the material that is in my expert report. I mean, that's the level of it, okay, making the same observations in terms of a scientist, what I observe and inferences that I make.

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Q. Now, if you would flip to the next page, your talk was called: Nanomotors & the Genius of God.
A. I didn't come up with that title.
Q. But was it one of the things where you were trying to present to the people at the event, that nanomotors show the genius God?
MR. WHITE: I didn't hear the question.
BY MR. LUCHENITSER:
Q. Was it one of the things you were trying to present to the people who attended the event, was one thing you were trying to present that nanomotors show the genius of God?
A. Right, in terms of the context of that. If I were talking about this in, say, a secular environment, you know -- again, I didn't come up with this title, it was assigned. I had told the program director, whatever, that I was going to be talking about macromolecular machines as evidence for design. And they thought -- I think the thinking was that's a complicated title to the lay person and they pre-formulated it and there it was.
To me that is -- personally I wouldn't have chosen that because it's risky. I mean, this is on the internet, my colleagues are looking at

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this and going, you know --
Q. And I get to ask you about it in your deposition.
A. Right, exactly. But to clarify this, going back to the point that is even recognized in the Department of Energy's web page, "The molecular machines we find in the simplest of organisms dwarf the engineering feats of the twentieth century, the industrial age."
Geniuses make engines, motors, so I don't think it is out of line to ascribe the things that are beyond our present intelligence to produce are the product of a genius, okay?
MR. LUCHENITSER: Thank you. Let me go on to the next one, Exhibit 4.
(Deposition Exhibit No. 4 marked for identification.)
BY MR. LUCHENITSER:
Q. Did you give a presentation about intelligent design at Trinity Church on October 13, 2002?
A. Whoa, where is Trinity Church?
Q. It's in the upper right-hand corner of the exhibit. For the record, this document has been marked as Exhibit 4, it's a document entitled:

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Science and Christianity in Conflict, Trinity Church, October 13, 2002.
MR. WHITE: Object to lack of foundation, authenticity, hearsay.
BY MR. LUCHENITSER:
Q. Was this a program where you had a presentation or was this a document --
A. I'm trying to think --
Q. -- that was meant to cover the entire thing?
A. I don't know, I don't know, I don't recall. I don't know where Trinity Church is. I know Jed. But I haven't talked to them at a meeting with Howard Berg. I think it is part of a curriculum that Jed was teaching at the University of California at Berkley.
Q. There is a section on page two, a section nine, "Conclusion: Real Christians Love a Challenge," "A. Scott Minnich's yop cannon."
A. I have a cartoon that I had -- one of the students in the lab actually drew that I used in seminars when we were trying to explain the similarity between the flagellum and a type III secretory system. At the time, this was in the early nineties, and this is a radical hypothesis.

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that we were saying these two are related systems.
Yops are -- stand for Yersinia outer proteins. These are the toxins that are injected into mammalian cells responsible for the disease of plague. And so we looked at the basal body of the flagellum as a cannon propelling or secreting these toxins.
But, no, I don't know where this came from.
Q. Yes, that doesn't seem like a presentation that you did.
A. Yes.
MR. LUCHENITSER: Let's mark this one as Exhibit 5, please.
(Deposition Exhibit No. 5 marked for identification.)
BY MR. LUCHENITSER:
Q. Did you present --
A. I did.
Q. -- at the Veritas Forum?
A. I did.
Q. "From The Big Bang Biology." We have marked as Exhibit 5 a document relating to this presentation.
And on the first page it is titled --

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well, first let me ask you, were one or more of the organizations that sponsored this -- or co-sponsored this event a religious organization?
A. I don't have any knowledge that it was other than the sponsors that are listed here.
Q. Do you know if any of those are religious organizations?
A. American Scientific Affiliation, I'm not a member of, is a group of scientists that are Christian, some of them very adversely against intelligent design. Templeton Foundation, I know a little bit about that in terms of sponsoring --
Q. Who are the Templeton Foundation?
A. I don't know, I mean -- I don't know. And Veritas Forum, I'm not sure what their history is or who is involved in that.
Q. And the title of this event is: "From The Big Bang To Biology, does the latest evidence point back to God?" Was one of the points in your presentation at this event that the evidence that you have studied does point back to God?
A. I made it clear that the evidence was consistent with a designer, I don't think I used the word God. I may have, I don't know, I don't recall. I mean, I don't know.

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Q. And did you also give a presentation about intelligent design at an event called, "Fingerprints of God, intelligent design points to our creator," which was hosted by the Fourth Memorial Church on or about April 9, 2005?
A. I did.
Q. Are there certain core concepts that provide the scientific basis for the intelligent design theory?
MR. WHITE: You were trailing off on the question a whole bunch, I'm sorry.
BY MR. LUCHENITSER:
Q. Are there certain core concepts that provide the scientific basis for intelligent design theory?
A. Yes.
Q. What would they be?
A. I mean, they would be the concept of irreducible complexity and aspects of information theory. It would be critical analysis of current Darwinian explanations, so there is that aspect of it.
(Off the record.)
(Lunch recess taken.)
MR. LUCHENITSER: We're back in session.

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BY MR. LUCHENITSER:
Q. We were talking about irreducible complexity when left off before, and we go to pages six through seven of your report, the last full sentence on page six of your report. It will say, "Irreducible complexity, a term coined by Michael Behe in his scientific argument for intelligent design, essentially states that molecular machines are comprised of a core set of components essential for function of that machine. If that component is removed from the machine, there is a resulting overall loss of function."
Is that your definition of irreducible complexity?
A. Yes, that's my interpretation of my exposition.
Q. So is it correct, in order to be irreducibly complex, all that is necessary is that a system needs to have multiple required parts?
A. I mean, essentially, yes, that you have got a consortium of elements, all of which play an essential function in the machine.
Q. Now, on page seven there is a big long paragraph in the middle of the page, and kind of in the middle of the paragraph you say, "The common

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feature for similar efforts on each cellular machine is that all of the components, or a core subset of movable parts, are essential for function; in short, the systems are irreducibly complex by definition."
A. Can I qualify that?
Q. Okay.
A. Or expound on that? Irreducible complexity, the principle of irreducible complexity is essential in modern day molecular genetics. We can't look at an organism's genome -- you know, when we started out this process and determined which genes were involved in what process in the cell, all of the genes, the 50 genes -- there is some variation, depending upon organism, are identified by mutation, okay?
So if I am working with E. coli and I want to know all the genes involved in making a flagellum, I don't have a blueprint for the organism, all I know is that it can swim. I mutantize a population of cells and I screen for ones that have lost the ability to swim, okay? And then I map all those genes, determine which ones are redundant, you know, mutations in the same gene, how many unique genes are involved, that identifies all of the components in that process that either

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destroy motility, abrogate motility, or attenuate it, they can't change direction, or whatever.

So this is -- I mean, this is the bread and butter of molecular geneticists in modern-day biology. This goes back to Beadle and Tatum, historically, the whole concept where they were able to mutantize Neurospora, bread mold, and then play these organisms out, the survivors, and then pick them onto what we call minimal media and identify nutritional mutations, organisms that were --mutants that were conditionally lethal and identify what those genes meant. One gene, one enzyme at that point. Now, it is a little more volatile at this point.

But that was a key fundamental discovery in genetics, that mutations produce phenotypic differences that we can identify and that they are specific to that function in general. Now, you can grow pleatrophic genes, regulatory genes that have multiple function.

But by and large -- I mean, each component of the bacterial flagellum has been identified because it is irreducibly complex, each gene was identified by mutation.

I want to make this point, too, because

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Ken Miller, I think, skews this a little bit. So if you look at the flagellum, it has 50 components, all of which are required. In the type III secretory system there are a base core of 10 proteins that are similar between these, but all of those are essential for the function of the type III systems.

It is not saying that you can't have the same proteins involved in another machine, okay? But it is saying that those two, based on their core composite elements, are identified because of irreducible complexity.

Q. Can something be irreducibly complex if it has some components that are not necessary for it to function but a core subset of movable parts is necessary for function?

A. Right, like I said, there are some genes involved in motility of bacteria that contribute to chemotaxis in the sense that they are involved in monitoring the environment and feeding those signals back to the flagellum to change its direction which will change the direction the organism is going. You knock out one of those genes, the organism can still swim, but it can't respond to chemical gradients, it can't make -- it is stuck in a default position. It is either swimming straight forward

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all the time or it just sits there and spins randomly.

Q. Is your definition of what is irreducibly complex different from Mr. Behe's or is it the same?

A. No, I think we agree.

Q. Because it sounds like you are saying that something can be irreducibly complex even if you remove a few components and it still works as long as there is a core subset of components that doesn't work, I mean, can't be removed.

A. I mean, look at it in this context. You can have a stripped-down engine in a car, all right? And you can identify the essential parts by removing a drive shaft or a piston rod or a coil plug and say that's equivalent. Now, if you put an air conditioner on there with a vacuum pump that is an accessory, the engine still works but you are losing part of its overall system.

So it's not -- you can still drive a car without an air conditioner, all right? So there are other components that play a role, maybe, in the overall function of a machine but are not necessary for its survivability.

Q. Now, by your definition wouldn't all life forms be irreducibly complex because they would have

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some core components that are necessary for function?

A. You bet, I would say if organisms were not irreducibly complex, we would know very little about them. Because again, this is the way molecular genetics works by mutational analysis. You knock out, you do a general mutagenesis -- our job, the hard part of our job is developing a screen or a selection to look only at the functions we are interested in and against all the other mutations that are occurring in the cell.

Q. Now, maybe I was wrong, but it seemed that Mr. Behe's definition of irreducibly complexity was that all components had to be required, not just the core components. Is that his definition, or am I misinterpreting what his definition is?

A. I haven't talked to Mike for a couple of years, so I'm not in terms of, you know, if he has modified his or if I am modifying mine.

But I will make the example, a specific example. When I looked at the bacterial flagellum, all of the physical components of the engine itself we know are essential, it is irreducibly complex by definition.

Now, there are genes in segments of

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transcription units that are involved in chemotaxis or sensory perception. You can make a mutation in those, the organism can swim so it is not affecting motor, but it doesn't swim intelligently. In other words, it can't change direction. If there is a food source in this corner, it doesn't know it and migrate in that direction. Or if there is a repellent, something that is harmful, it can't backtrack away from it down a chemical gradient. Does that make sense?

Q. Now, your views on irreducible complexity, are they based on Mr. Behe's work or are they based on any independent research or theoretical work of your own?

A. On my own experience. I mean, this is what I do in the laboratory. I want to know how something works, I don't have the blueprints, I've got to break it down and figure out who the actors are in that play, okay?

Q. Would you attribute the concept to Mr. Behe?

A. I think he coined the term, but to a molecular geneticist it resonates, I think with all of us. I knew exactly what he was talking about when I read the first few pages in his book,

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Darwin's Black Box.

Q. How do you determine what a core component of a system is?

A. By looking at all the essential genes that are involved. If I went into my office and came back with a textbook, Molecular Biology of Escherichia coli and Salmonella typhimurium, I could give you a genetic map of all the 4,000 plus genes, and in there there is a list of all the flagellar genes. Okay? All the genes involved in flagellar biosynthesis, and next to it it will list what we call a phenotype, what is the effect if you make a mutation of this gene.

It says those that can't swim, can't swim, loss of chemotaxis, can't build a basal body, can't build a drive shaft. Do you see what I am saying? All the components are determined because if you mutantize that gene you loose function and it is easy to screen.

You know, I can take you in the lab and show you, you know, we have a soft auger, that we call it, and Petri dishes, and we can take a mutant colony from a plate, stick it in that soft auger and put in the incubator, come back in 12 hours and say, "Can those organisms radiate out from the center of

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inoculation?" If they can, they can swim. If they can't, they are stuck there, just a point of inoculum of cells.

Q. Now, is the concept of irreducible complexity an essential component of intelligent design theory?

A. Yes, because natural selection says that over time you can have mutations that can fashion these sophisticated engines, all right? And you can co-opt and modify existing genes in an organism and build these machines. What it requires is that each step of the way is conferring some selective advantage, but we know in the end product that if you don't have one component, there is no function and therefore nothing to select, nothing for nature to select.

Let me describe it this way. Yersinia pestis, the agent of bubonic plague, has a type III secretory system. It also has all of the genes required to build a flagellum. But it has been described, since it was first isolated by Yersin at the turn of the last century, as a non-modal organism. It is one of the classification requirements to identify Yersinia pestis from related organisms.

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Now, we hypothesize that the flagellum in the type III secretory system initially had overlapping functions, that was the simplest explanation.

It also said that because Yersinia pestis doesn't have a flagellum, you know, it doesn't swim, our hypothesis stated it has to have the genes for the flagellum, part of which has to be expressed for our yop cannon to function. That's a testable hypothesis. You do the sequence analysis and the genes are there.

Now, we know there are separate parallel systems, and we can get into that later, which I discuss in that paper that Steve and I wrote. But here is a situation where you have got 50 genes in a chromosome required to build a flagellum. It has a mutation in the master control switch.

So in essence, you know, from a Darwinian perspective, you have now all of the 50 genes required for function, all you need is a mutation to give you the -- excuse me, you have 49 out of 50, let's say hypothetically, you are just waiting for number 50 to come on.

What happens, though, in actuality, when I go through the entire genome of Yersinia pestis,

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the other 49 genes, you know, a number of them have been debilitated by deletions, by insertions, because there is no function associated with them, they are silent in the chromosome and they are lost by mutation, never to be recovered again.

Now, in one sense a biologist will argue, well, that makes sense. If you don't use it, you lose it, all right? On the other sense, you have to have this gradual accumulation of this information that is ultimately going to cobble itself into a pretty sophisticated machine.

You can't have it both ways, all right? It's a conundrum. If you don't have a function there is nothing to select.

Q. So is it your position that irreducibly complex systems cannot evolve?

A. That's a qualified position. I think that you can get gene duplication. You may even be able to co-opt certain parts of one motor. I think we could look at some of these molecular machines as composite machines. There are, say, multiple components that can have different uses under different environments -- environmental conditions.

Q. So some irreducibly complex systems can evolve and some can't, is that what I am hearing?

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A. It's a fine distinction. The flagellum is an example of irreducible complexity by definition. The type III secretory system shares the components, all right? There are at least 30 components of the flagellum that are unique to the flagellum that we don't find in other organisms and the type III secretory system, which shares 10 similar proteins, there are about 20 that are unique to the type III system.

But the phylogenetic analysis shows that the more complex flagellum arose first from which, you know, the type III secretory system seems to have a sub function compared to the flagellum. It can secrete proteins like the flagellum, but it is not apparently spinning, it is not propelling the cell, it is just a nano syringe.

Did the type III system evolve from the flagellum? That's going from more complex to a more simplistic structure. Possibly I was willing to entertain that in the beginning as these results were being dissected.

In fact, I gave a talk at a meeting when Ken Miller was there asking the question, is type III secretory -- are the type III secretory systems co-opted from the flagellum. Now, from my further

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experience, and just what other things have been published about these systems, I am more reticent to say that's the case. I haven't ruled it out.

But I think Ken wants to look in -- he says, "Well, here is an intermediate structure, case closed, go home," you know, "what are you arguing about?"

I work on these systems. I think the data raises a lot more questions that are difficult for an evolutionist to assimilate than just simply saying this the intermediate that we are all looking for.

Q. So is it the case that you believe that some irreducibly complex systems can evolve?

A. I don't think we have hardcore evidence. I haven't ruled it out and that's as far as I go.

Q. So what is the utility of the concept of irreducible complexity to intelligent design theory if irreducibly complexity doesn't rule out the possibility that something evolved?

A. I think our experience shows that these machines are integrated, essential for functions of the cell. There are multiple components. I have a hard time envisioning what the intermediate steps are.

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Now, Dawkins would say I suffer from credulity, you know. I say I am a scientist and I'm supposed to be skeptical, you know? I don't -- you haven't shown me the necessary intermediates, so at this point the simplest explanation is I know these are irreducibly complex by my own experience in the laboratory. You know, that's where the data sits now. I think that's what the data is driving.

Q. Are you familiar with the term exaptation?

A. Exaptation? I mean, I have heard it, but I'm trying to place it in terms of the context. That you are accepting something out of something else, is that --

Q. What is your understanding of what it means?

A. I don't know, I don't want to -- I would have to look it up. I think it is probably similar to co-option.

Q. Anyway, what is your response to the suggestion that irreducibly complex systems can evolve because of a less complex version of the system might have had a different function when it had less proteins?

MR. WHITE: Objection. Did you say can

or can't?
MR. LUCHENITSER: Can.
MR. WHITE: C-a-n?
MR. LUCHENITSER: Yes.
THE WITNESS: Say the question again, please.
BY MR. LUCHENITSER:
Q. Why can't an irreducibly complex system evolve through the process whereby a version of the system that had less proteins or parts serve a different function, and then there was some mutation or mutations leading to the current system that serves the current function?
A. I'm not going to rule it out, okay? I think there is probably examples that will come up for specific systems and cells. I mean, organisms change over time. This involves change in function of motors. But looking at overall in terms of advancement and complexity from a bacterium to eukaryote to a mammal, that is a gross extrapolation of the information we now have available to us.
And that's what my colleagues, as neo-Darwinists, accept. I have a problem with it. They don't have the evidence to go that far.
Q. Would you acknowledge that exaptation or

co-option is part of the explanation of how organisms have developed through natural selection?
MR. WHITE: Objection, he said he didn't know what exaptation was.
THE WITNESS: Can we use co-option?
BY MR. LUCHENITSER:
Q. Yes, the same thing.
A. It's possible, but --
MR. WHITE: Just so I understand, so exaptation and co-option you are saying is the same thing?
MR. LUCHENITSER: Yes, the same thing.
THE WITNESS: But qualify it. Co-option, as we understand it in our natural experience, is a very intelligent process, okay? You know, and the hallmark of a good machine is it has multiple uses, so this could be built into the design as well.
If I design a vacuum pump, I can put it on my vacuum cleaner, I can put it on my automobile engine, I can put it on other systems, you know?
BY MR. LUCHENITSER:
Q. Could an irreducibly complex system evolve from a system that previously functioned but just did not function as well?

A. You can get optimization for certain functions if you maintain selective pressure driving it in that direction, but our experience is pretty minimal at this point. It think it's at the enzymatic level, it's at the -- and you can use it.
So again, these are micro-evolutionary changes that I'm not arguing with.
Q. Can the parts of a system evolve so that parts that initially could have performed a function without the presence of other parts co-adapt so that they become dependent on each other?
A. I think that's speculation at this point. It is necessary for an evolutionary perspective. I have seen arguments in the literature purporting that. I'm trying to think, I don't have specific examples in hand, but I think they are still open to question.
Q. Is it also possible that an irreducibly complex system can evolve from a larger system that was not irreducibly complex?
A. I'm trying to think in terms of -- you know, can you give me an example? So you have a non-irreducibly complex system spinning off of an irreducibly complex system?
Q. Right, a system that has got a bunch of

parts that weren't necessary and then you lose the unnecessary parts and you are left with the irreducibly complex part?
A. I don't know offhand any examples of that.
Q. And what about the possibility of a mutation that causes a change in how proteins in a biological system are deployed and affect several proteins at once? For example, a change in a gene that governs how several other genes express themselves, could that lead to the evolution of an irreducibly complex system?
A. Again, I'm not sure, without talking about specific systems, what you were getting at. I mean, you have a homeotic gene mutation in a fruit fly and suddenly, you know, you build legs where antenna used to be? Yes, that can happen.
Q. Are you aware of any evidence that irreducibly complex systems have in fact evolved in modern -- in recent history?
A. No.
MR. LUCHENITSER: Let's mark this as whatever the next one is here.
(Deposition Exhibit No. 6 marked for identification.)

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BY MR. LUCHENITSER:
Q. Okay, we are marking as Exhibit 6, we are marking an article by Glen Johnson, Rakesh Jain, and Jim Spain, Origins of the 2,4-Dinitrotoluene Pathway. Have you ever seen this article before?
A. I haven't, but I am aware -- I mean, there is a group here at the University of Idaho that is doing similar work on TNT degradation. This is done at an air force base, so the military had an express interest in degrading, you know, explosive compounds or their intermediates.
But this is a biochemical pathway, all right? Mike Behe talks about biochemical pathways as not being irreducibly complex. This essentially -- not having read this paper, but familiar with this type of work from my colleagues here at the University of Idaho, is that you can take organisms that have the ability to, say, de-nitrophy Benzine rings or de-nitrophy similar compounds, and you can run them through a selective process where this is the only nitrogen and carbon source and modify those enzymes so that now they recognize this compound, which they didn't originally, or very poorly, and develop an organism now that can utilize TNT or DNT as the sole nitrogen and carbon source, or as a

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major nitrogen/carbon source. But I wouldn't say that's an example of irreducible complexity.
Q. Why not?
A. It's just micro adaptation, taking information, enzyme systems that have similar function and putting them under stress so that you are selecting for changes, mutations that modify the enzymatic reactive center so that it is more liberal in the sense that it can recognize this compound instead of the ones that it originally was involved in modifying by catalysis.
Q. But isn't the new system not irreducibly complex and don't you need both the bacteria and the DNT to have this biochemical system?
A. Again, I would say biochemical pathways are not the same as a molecular machine. These are a series of enzymes that are involved in modification of substrates. And if you remove one part, you can still have some of those enzymes in the pathway functioning in other enzymatic modifications.
This is a good example of micro-adaptation. I don't think that this is, by definition, irreducibly complex by Mike Behe's example. So, you know, I mean there is a

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distinction here. I think that it is an important distinction.
Q. Are the bacteria themselves irreducibly complex?
A. They are comprised of irreducibly complex components. I mean, they are functions of macromolecular machines, all of which, as an integrate unit, are required.
Q. Doesn't the degeneration pathway have multiple required proteins?
A. Right.
Q. So I'm still not understanding why it is not an irreducibly complex system.
A. It is not, you know, the -- I know what I want to say, but in terms of articulating it to a non-scientist -- let me cogitate on that for a minute in the sense that, again, not everything in the cell is irreducibly complex, and biochemical pathways are one of the things that we have agreed have the ability to evolve over time and be modified in terms of especially catabolism/anabolism, all right?
If you feed a group of organisms a single carbon and nitrogen source, you are going to select for organisms that can use that, if that's the only

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thing available, based on the information that they have in other systems.
MR. WHITE: Who highlighted all of this on Exhibit 6?
MR. LUCHENITSER: I did.
THE WITNESS: Can I try and clarify this again?
MR. WHITE: What you are dealing now is Exhibit 6.
THE WITNESS: Right, Origins of the 2,4-Dinitrotoluene Pathway.
This is an example of micro adaptation. These organisms possess a series of enzymes that can make -- and, you know, in this case I haven't read this paper in full -- four modifications to open up this benzine ring, which is a very, you know, difficult process for organisms to do.
The enzymes involved in this process are modifications of the information that is already there where -- I am speculating, that enzyme one has a normal function in a different pathway normally. But you put that organism under selective pressure, you can modify that information and get a new function for those enzymes. This is micro adaptation. No one is arguing that point.

It is -- you know, we have already got a cell that is information rich that is producing a number of enzymes that are involved in different processes, some of which may be involved in an unrelated biochemical pathway, say for tryptophan regulation, another one that is involved in a different function, and under selective pressure you can get all of these participating in a novel pathway based on modification of their regulation.

But these were all present initially. You've got point mutations that are expressing them under different contexts, and, you know, you get a new function in terms of expanding the substrates this organism can live on. I don't have any problem with that.

(Deposition Exhibit No. 7 marked for identification.)

BY MR. LUCHENITSER:

Q. Can you tell me how you determine whether something is irreducibly complex?

A. Again, in terms of -- maybe this is a good way to look at it.

With the bacterial flagellum I remove one part, one gene, mutate one gene, you lose function. All of the other components are dedicated to that

system and they are rendered useless. In this system you remove one enzyme, but you've got the other set of enzymes that can be used in other metabolic processes.

Okay, so you are not completely destroying the system. You know, there are -- enzymes have, by definition, substrate specificity that can be narrow or broad and they can still function in the cell.

Q. So the enzymes can be used to perform a different function other than the function that the system performs?

A. Under the conditions that you are making your assay. If you give this organism dinitrotoluene as a sole carbon and nitrogen source and you throw out one of these genes, then you have knocked out the ability of that organism to grow under those conditions. But if you supply some other carbon source that is maybe a little bit different from this, you only need three out of the four enzymes, the system still works.

Whereas the bacterial flagellum, you know, we know that that's what their dedicated function is in terms of a rotary engine.

Q. But now is it correct that there are

various proteins or enzymes in the flagellum that can serve different functions in different kinds of cells?

A. No, there can be other machines that employ similar proteins for that similar function. But they are, by definition -- by Mike Behe's definition, those are irreducibly complex even if they have the same component.

Look, you pull out your cell phone and you remove a transistor your cell phone doesn't work. You go to a computer, you remove the exact same transistor out of it, you lose function on your computer.

Q. But you can use a transistor for something else?

A. But you can use the transistor for -- you employee it in different functions on designed systems and, you know --

Q. So is a cell phone irreducibly complex?

A. Do you want to do the experiment? Hand me yours, let's find out.

Yes, I'm sure there are components on there that are necessary. I mean, you could still operate it maybe without the screen. But you pull out your battery or transistor or relays on there

and it is not functioning.

Q. Let me just make sure I get this straight. If a component of those systems can have a function in a different system, is the first system irreducibly complex? If you have system A and --

A. Sure, that's what I am saying. If the trans -- you find the same transistor with the same serial number that is made by the same company and two different systems, they are essential for those functions, right? It doesn't mean that the green board from your computer evolved into the little chip board in your cell phone.

Q. Now, let's get back to figuring out whether some of these are irreducibly complex or not. How do you determine what the proper system to look at is? And let me give you an example with respect to the flagellum, how do you decide whether you should be looking at the entire bacterium or just the flagellum? How do you define what the system is?

A. By mutational analysis, you make mutations, you screen for organisms that have lost the ability to swim and you identify how many genes are involved, and you can say this essential core of

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genes coding for this essential core of proteins make this rotary engine. If I remove a drive shaft, it doesn't work, if I remove a u-joint, it doesn't work, if I remove the propeller, it doesn't work, if I remove the stator, it doesn't work, if I remove the rotor, it doesn't work, if I remove the battery, it doesn't work.

Q. But how did you decide whether to look at the entire bacterium or just the flagellum in the first place?

A. Because I am interested in the flagellum biosynthesis. I mean, the whole organism is pretty complex. Yes, I can make you mutations and identify a core set of essential genes, you know, that are essential to that organism, but that's tricky stuff. You have to get temperature sensitive mutants or partial diploids to allow that analysis.

In other words, DNA replication is essential for the existence of an organism, right? Transcription is essential, translation is essential. All of those have been identified by mutational analysis and then identifying how many components are involved in those molecular machines.

Q. How do you determine -- when you are looking at the system, how do you determine what the

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limits of the system are? And again, for example, with respect to the flagellum, what if you have particular proteins that function both inside and outside the flagellar system?

A. Well, you look for pleotrophic effects, many-fold effects. Now, there was a gene that I have worked on extensively that is referred to as FLHDC, that's a master control switch. All the early experiments, it was identified because you knock it out, you don't get any expression of flagellar genes.

When we have available, you know, micro-array analysis, we can look at the global effect a mutation has and find that it is also regulating multiple -- at least 30 other non-flagellar operons in the cell. I have done that work myself, as well as colleagues at the University of Illinois.

That is a regulatory gene that is involved in the regulation of multiple systems in the cell, we call it a global regulator.

Q. And now how do you -- in trying to figure out whether something is irreducibly complex or not, how do you determine what the parts are? Again, with respect to the flagellum, how do you make the

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decision as to whether the part should be considered to be the proteins or each specific gene?

A. Okay, again, that's somewhat a redundant question. It is a mutational approach, or you can use a biochemical approach as well. You can purify these structures, which is, you know, possible, and dissect it in terms of -- if I have a good biochemical purification scheme where I can purify a flagellum away from the rest of the cell, then I can disrupt that and ask how many proteins are present, that's one approach, that's a biochemical approach.

Or I can use a molecular genetic approach and mutantagize a population of cells, expose them to ultraviolet light, expose them to some carcinogenic compound that causes mutations, hit them with a transposon and collect survivors on a Petri dish and then pick them individually into a soft auger, and then ask, "Can you swim or not?"

I can, say, isolate 4,000 mutants that now cannot swim and then I start mapping those by genetic techniques to where they lie in the chromosome and then differentiate how many are redundant mutations in the same gene, how many different genes are involved. That's how you do it.

So you reduce -- you are looking at a

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large number of mutations that have the same outward expression, they can't swim, map those genes and find out how many different positions there are on the chromosome and then determine how many genes are essential for building a flagellum.

Then you go on to intermediate stages of the flagellum and say if I knocked out the u-joint, I know biochemically how many components are there, I look at mutations of one gene and ask, you know, how many components does the cell assemble at that point and which ones are missing. And I can look at what we call epistasis, what genes are required to get to this point, to get to this point. Is that making sense?

Q. You are explaining how you figure out whether something is irreducibly complex, but I'm not sure how you first made the decision as to what system you look at, what the limits of the system are, and what should be considered the parts. For example, why do you look at proteins as opposed to the individual molecules or larger parts?

A. This is all boiler plate standard -- biochemistry standard molecular genetics. There is a genetic approach to these problems, there is a biochemical approach to these problems, you can

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combine both to get to the answer.
You are asking the question, how do you determine all the component parts of the flagellum? I mean, that's a valid question, I am really interested in that, a lot of people are. It has all been assembled by reverse engineering, by reverse genetics. Make a mutation, find out what you screwed up.
You know, have you got a drive shaft, have you got your stators, you have got your u-joints, et cetera, and find out which is missing or which parts are missing.
Q. Are there any animal species that you believe are irreducibly complex?
A. All right, I mean --
Q. Are humans irreducibly complex?
A. Do you want to do that experiment?
Q. I wouldn't want to have it done to anybody here.
A. All right, yes, I think we have essential components that if you remove them, you know, it is going to have a profound effect on your health and well being.
But there are parts that aren't essential. I mean, you can look at the eye in terms

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of its function as, you know, irreducibly complex as a camera lens, but is it essential for the human as a whole? No, you can live without your eyes.
Q. So it sounds like what it comes down to is anything that has essential components is irreducibly complex?
A. By definition, to perform that function, there is a core set of proteins required, that if you remove one, you lose function, okay? And therefore, you can identify each component that plays a role in that function for that specific machine or system that we are talking about.
Q. And does every living system have essential components?
A. You bet.
Q. And so I am getting a little lost as to what the utility of the irreducible complexity is. If every living system has essential components and every living system is therefore irreducibly complex, then does that mean no living system at all can evolve?
A. No, no, it is not saying that. The flagellum is an irreducibly complex machine but it is not essential for the life of a bacterium to a adapt to changing environments. In fact, there is a

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strong selection for pathogenic organisms to lose flagellum biosynthesis.
Q. Let me just try and see if I can understand what the utility of irreducible complexity is -- of the concept of irreducible complexity is to the intelligent design theory. It seems like you are not saying that if something is irreducibly complex that that necessarily means that it was intelligently designed; is that correct?
A. I think you can infer intelligent design. I think you are misinterpreting what I am saying or maybe not understanding these ideas, so I have a hard time following your train of thought or your question, where you are going with this.
Because again, go back to the flagellum. It is a machine that is -- what?
Q. I'm going to interrupt you. It seems like you are saying --
MR. WHITE: Let him finish what he was saying.
THE WITNESS: You were just giving me an odd look and --
BY MR. LUCHENITSER:
Q. I was confused. It sounds like you are saying all living systems are irreducibly complex?

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A. No, that's what you are saying, I'm not saying that. Or you are trying to get me to say that for some reason.
MR. WHITE: Why don't you ask the professor what he is saying, if you are having a hard time.
BY MR. LUCHENITSER:
Q. Okay, you are saying all -- anything that has essential components is irreducibly complex?
A. Right.
Q. And all living systems have essential components.
A. For specific functions, not all of which may be essential for the life of that organism. A bacterium can live fine without a flagellum, okay?
Q. So you are not saying all living systems are irreducibly complex?
MR. WHITE: Objection as misstating prior testimony and confusing everything.
BY MR. LUCHENITSER:
Q. So it is not your opinion that all living systems are irreducibly complex?
MR. WHITE: Objection.
THE WITNESS: All organisms have irreducible complex components, all right? You are

dependent upon -- your cells are dependent on DNA replication which involves a macromolecular machine that transcribes your DNA, all right? If you remove one component of that apparatus you are dead, okay?

So I don't know why you want to broaden that and -- but, yes, by definition there are irreducibly complex macromolecular machines in all living organisms from the simplest to the most complex, but I'm not saying they are all essential for the organism to live. They are essential for the functions that they are designed to carry out.

Q. Is it correct that you claim that the bacterial flagellum is irreducibly complex?

A. Right.

Q. Is there a particular strain of bacterium that you are referring to when you claim that the flagellum is irreducibly complex?

A. I think the gold standard in this is E. coli and salmonella and Caulobacter crecentus, but I want to qualify that in the sense that there are different structural components of different bacterium. You know, if you look at a gram-positive organism compared to a gram-negative organism, like E. coli and salmonella, they don't have an outer membrane, gram-positive organisms don't have an

outer membrane so they don't require the O-ring in that structure as part of the -- what is the word I want, anchoring of the structure in the cell. Okay.

So there are modifications from organisms in terms of their structural constraints from one group to another.

Q. How many different strains of bacteria that have flagella are there?

A. Nobody knows.

Q. Is it hundreds, thousands?

A. Thousands, right.

Q. Have you studied each and every strain's flagellum to ascertain whether it is irreducibly complex or not?

A. Nobody has.

Q. So is it possible that there are some strains of bacteria there have flagella that are not irreducibly complex?

A. I think for that organism, under the conditions that are irreducibly complex, you would apply the same criteria to identify the players. There are marine organisms in the genus vibrial that instead of running a proton motive force run a sodium motive force, and that implies that you have differing constituent parts for the environments in

which these organisms live, and I don't have a problem with that. But if you remove the sodium pump from vibrial it is screwed, just like you remove the proton pump from E. coli.

Q. When you say that the flagellum is irreducibly complex -- well, first let me ask you, how many proteins are there in the flagellum principle? You say E. coli is the best example you want to use, how many proteins are there in that flagellum?

A. In terms of the structural components there are about 30. In terms of when you expand that to include the chemotaxis sensory transduction system and the regulatory genes, it requires about 50.

Q. So is it 50 total or 30? 50 if you include the regulatory.

A. Fifty with the regulatory and the hard wiring to a sensory perception system that is monitoring the chemotaxis system.

Q. And 30 if you don't include those?

A. Right, just the core flagellum.

Q. Now, is it your claim that removing any one of the 50 proteins will keep the flagellum from working at all or it just that some proteins that

can be removed and the flagellum wouldn't work as well?

A. The 30 core elements that make up the structure are essential, we know that by mutagenic analysis. As I mentioned before, if you knock out a chemotaxis protein, you can still have an engine that will spin, it may not be able to reverse direction so it has lost its sensory perception mechanism.

If I take out your eyes you can still walk. You may walk across a street in traffic and that can be a problem, but you can still walk. So that's what I am saying.

When you knock out chemotaxis, you knock out your sensory perception, and the organism is at risk in terms of being able to monitor its environment in making decisions in terms of there is a food source over there and I want to go in that direction, you know? There is a repellent over here, I want to move away from it.

Q. So there are some proteins you can remove from the flagellum and it will work but it just won't work as well, is that what it comes down to?

A. These are involved in a hard-wired system

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that is driving the flagellum in terms of, you know, making decisions based on the environment.

As I said before, there are irreducible complexity, you knock out a component, you either -- if you remove one component, you lose function or you attenuate that function.

Q. By attenuating, you mean impair?

A. Right, right.

Q. Are you aware of any scientific articles, any articles published in the scientific literature that have a contradictory claim that the flagellum is irreducibly complex?

A. Yes, Ken Miller and I disagree on that.

MR. LUCHENITSER: Let me have you mark this.

(Off the record.)

BY MR. LUCHENITSER:

Q. Before we get to that, the one that is marked as Exhibit 7, let me just ask you, have you ever seen this article before?

A. Yes. Not the specific one, but, yes, it's the one Tonegawa won the Nobel prize for.

Q. You say you have read this article?

A. I don't know if I have read this specific one. I have read reviews on this. I'm not an

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immunologist, but in general I know the system that he is talking about.

Q. And this system he is talking about, is that an irreducibly complex system? Just for the record, we are looking at Exhibit 7, an article by Sakano, Huppi, et al, called: Sequences at the somatic recombination sites of immunoglobulin light-chain genes.

MR. WHITE: And I'll object as he hasn't seen this article before.

THE WITNESS: Yes, I mean, I don't want to box myself in, because that's a very broad question. Are you saying is the immune system irreducibly complex? Is immunoglobulin biosynthesis irreducibly complex? Are B-cells irreducibly complex? Are the recombination sites involved in cassette shuffling of the variable sites of antibodies irreducibly complex? I would speculate there is a core of genes in this system that are.

BY MR. LUCHENITSER:

Q. Do you know whether anybody has explained how that core of genes could have evolved?

A. Again, I'm not an immunologist. I am familiar with this in the sense of, this was a conundrum for years in immunology. I mean, the

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basic principle that Tonegawa worked out was looking at the question: If I immunize a mouse with foreign materials, they can mount a repertoire of over, you know, 10 million different antibodies. These are all proteins, they are all different, they have the potential to be different, and our thinking at the time was one gene, one enzyme, one protein, where is that information coming from? Because we are thinking that one gene codes for one, in a sense, antibody, well, this exceeds the genetic capacity of these organisms.

So it was a real paradox in biology in terms of explaining this. And what Tonegawa showed was that you have cassettes of DNA that are involved in antibody synthesis, you have differential gene splicing that can give you different reading frames for different amino acid sequences, and that B cells can undergo a higher rate of somatic mutation than normal cells.

All of these contribute to generating the variation that we find in antibody systems. You have this built-in genetic scrambler that is producing variant amino acid sequences in specific sites in these proteins that can then recombine in different sequences with heavy chain, light chain,

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constant regions.

MR. LUCHENITSER: Let's mark this article here as the next exhibit.

(Deposition Exhibit No. 8 marked for identification.)

(Recess taken.)

MR. LUCHENITSER: Back on the record.

BY MR. LUCHENITSER:

Q. We are looking at Exhibit 8, it's an article by Robert Macnab, and it is called: How Bacteria Assemble Flagella. And was Mr. Macnab considered one of the top researchers in the flagellum field?

A. You bet, he was at Yale University, I knew him.

Q. Have you read this article before?

A. I don't know if I read this specific one. I probably read parts of it, but I have a good understanding of this in terms of my own work.

Q. If you could, flip to page 82 which is where I have the tab marked Table 1. Can you -- I believe there is a list of about 34 proteins, can you tell me which of the proteins are required parts in which ones are not?

MR. WHITE: Required parts of what?

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MR. LUCHENITSER: Of the flagellum.
BY MR. LUCHENITSER:
Q. Can you just say which ones you think are not required?
A. Well, all of these are -- it doesn't have chemotaxis proteins in here. All of these are required for flagellum function, okay? Some of them are involved in protein export in terms of these type III systems. These are the channels for which these proteins are exported.
But, yes, if you make a mutation in any one of these genes, they have been identified by loss of function.
Q. You are saying each one of these 34 or so proteins is required?
A. Right, for optimum assembly. I mean, you could look at a negative regulator FliH. If you lose that, then you may have deregulation of some components.
Q. What was that one called?
A. FliH. Chaperones FliJ, you can still get export. Without a chaperone it is just not as efficient.
Q. Now, are any of these parts missing from some bacteria?

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A. Sure, we talked about it before, gram-positive bacteria don't have an outer membrane so you don't need that outer ring structure. FlgH, I'm not sure, outer membrane.
Q. So if some bacteria don't need these parts, how is it that all of these parts are essential?
A. You anticipate that question. In terms of the individual organism, there are different constraints. If you are gram-positive, you don't have an outer membrane, there is a not an essential requirement for having an O-ring, but you can't take that gram-positive bacillus flagella and put it in E. coli and expect it to work.
So there are constraints by the system that determine which parts are necessary, you know, by definition. If you want to then extrapolate and say at some point, you know, the flagellum evolved from a gram-positive into a gram-negative, well, that's speculation.
But, you know, it may be that that could have occurred, that there is enough core function that if you need another O-ring structure, you can, you know -- but if you ask is FlgH essential for function in E. coli or salmonella or Yersinia? You

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bet. Is there an FlgH counterpart in a gram-positive organism that lacks an outer membrane? No, there is not.
Q. And for the moment, let's see, on the page of your report, nine --
A. Page nine of what?
Q. Of your report, Exhibit 1. You say that -- somewhere in there you say that of the 30 proteins or so that are found in the flagellum that are not found in the type III secretion system, none of those 30 proteins are present in any other living system.
A. Other than bacteria.
Q. Yes, at the beginning of the second paragraph on page nine. First sentence, "Additionally, the other 30 proteins in the flagellum motor that are not present in the TTSS are unique to the motor or are not found any other living system."
A. Okay.
Q. So are you aware of anything that makes a claim to the contrary?
A. Not at this point.
Q. Are you aware of any scientific literature that describes or explains that there are

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many proteins, excluding the type III secretion system, there are many proteins in the flagellum that are homologous with proteins in the non-flagellar systems?
A. I don't know. I mean, not at this point, but there may well be in terms of new information that has come out. Give me an example, if you have one.
MR. LUCHENITSER: Let's mark this as the next exhibit here.
(Deposition Exhibit No. 9 marked for identification.)
THE WITNESS: Let me qualify that. I'm not sure of that, but there is a --
MR. WHITE: Go ahead.
THE WITNESS: I am just thinking here in terms of examples of how that would extrapolate. I mean, there are ATPase involved in flagellar protein assembly and export, there are ATPase also involved in other systems in the cell. That's a sub component of the flagellum. Is this it?
Q. Exhibit 9 we have marked is an article by Cascales, Lloubes and Sturgis, and it is called: The TolQ-TolR proteins energize TolA and share homologies with the flagellar motor proteins MotA

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and MotB --
A. MotA and MotB, these are motor proteins.
Q. Have you reviewed this article before?
A. No, I haven't.
Q. Are you familiar with the work described in this summary of the article?
A. Part of it, but I haven't read this paper. Yes, I would like to, if I could.
MR. LUCHENITSER: Let's mark this as the next one.
(Deposition Exhibit No. 10 marked for identification.)
BY MR. LUCHENITSER:
Q. We have marked as Exhibit 10 an article by Kojima and Blair entitled: Conformational Change in the Stator of the Bacterial Flagellar Motor. Have you seen this article before?
A. I haven't seen this one, but I know David Blair's work.
Q. From the abstract, or from reviewing the abstract, can you tell me if you are familiar with what this article is about?
A. Yes, I mean, he works on the motor of the flagellar MotA and MotB in terms of proton channeling. Yes, I am familiar with some of this

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work.
Q. If you could flip to page 13048, if you could read the two highlighted sections on that page?
A. MotA?
Q. Yes. Just tell me when you are done reading the highlighted sections.
A. Okay, I've read the first part, okay.
Q. Are you familiar with the work described in those highlighted sections?
A. Right, MotA and MotB are involved in the stator, conformational changes that drive direction of the rotor, okay.
Q. This work here, does it contradict your claim in your report that the 30 proteins in the motor that are not in the TTSS are --
A. Look at the –
Q. – not a living system?
A. Look at the wording, "A membrane complex that undergoes proton-driven conformational changes could perform useful work in contexts other than (and simpler than) the flagellar motor, and ancestral form of the MotA/MotB complex might have arisen independently of any part of the rotor."
Those are speculative, you know.

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conjectures. Could, might, possibly, you know?
"Together, these facts make a reasonable case for an evolutionary connection between the Mot proteins of the flagellar motor and the Exb proteins of outer-membrane."
So this is part of reasonable discussion saying this is speculation. That doesn't mean it is true, and -- but it is part of this argument and I have no problem with it.
Q. Now, I think before you said that some of the proteins in the flagellar motor was one called the ATA system or --
A. ATPace, right.
Q. So those are used in some other living systems, too?
A. Well, if you look at Macnab's -- so this is Exhibit 8, where that table?
Q. Table 1, page 82, the one that is marked by the little orange tab.
A. I think -- I can't remember the nomenclature. It has changed over the years. Several of these proteins, in terms of export function, are ATPace, they are components of an ATPace that you find in other systems in the cell.
Q. So are you standing by the opinion you

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expressed on page nine of your report, that first sentence in the second paragraph where you said, "Additionally the other 30 proteins in flagellar motor (that are not present in the TTSS) are unique to the motor and are not found in any other living system," is that an opinion you are standing by or is that an opinion that you modified?
A. I think in general I will modify it. I mean these TolQ and TolR may be related proteins, but it doesn't necessarily mean that they have evolved from MotA or MotB. They are involved in proton channeling in the cell and there are other systems that require protein channeling hooked up to Tone B and some of these other ones.
If you want to make the speculation that one is derived from the other or they are one and the same, we are not at that point yet.
Q. Are you aware of flagellar use for functions other than swimming?
A. Yes.
Q. What functions are these for other than swimming?
A. I am collaborating with Mike Conkle with Washington State University and Campylobacter jejuni and -- this was actually one of my original

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hypotheses when we were working on type III secretion systems, that the flagellum -- we were limited in our understanding of the flagellum as an outboard motor propel the cell. Within that function is also a highly dedicated specific protein secretary device, all of the proteins that are involved in the assembly of the flagellum, you know, the propeller that can go out to ten cell lengths, ten micrometers in length, are transported through the hollow core and they assemble or preliminarize at the distal tip.

So there is a protein secretory component of the flagellum. We hypothesis that the flagellum could be used for other secretion of flagellar proteins and we made mutants to show that, and we actually gave those mutations to Virginia Miller at Washington University in St. Louis and she showed that -- her students showed that a phosphoratase is used as a means of export, the flagellum is used to export a protein that is required for virulence, and this was our original hypothesis; that in talking with Bob Macnab and other people in the field in the early nineties, they considered this a whimsical idea at the time, but it has proven to be true. And that was in part from reverse engineering.

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I am working with Mike Conkall over at Washington State University, Campo Bacter Dejuni secretes a set of proteins that by all trade marks are type III secretory proteins, but there is no type III syringe in the genome of the cell, which perplexed him.

I said, "Well, you've got one, you have a flagellum, and maybe the flagellum is being used to secrete these proteins." And through collaboration that has been shown to be the case.

Q. Can a flagella also be used for the purpose of bacteria making contact with other bacteria or cells of other living bodies?

A. Sure, it can be used as an adhesant. That's another thing that we are looking at with E. coli 0157, which is a pathogenic strain of E. coli. But there are -- we have hypothesized that the flagella could interfere with type III secretory systems that are involved in secretion of anti-host factors, and that this would fit together a lot of observations why significant major human pathogens like Yersenia pestis, Shigella dysentery, Gordetella pertussis are non-modal, but they have the remnants of flagellar genes in their genomes.

So there was a strain -- a highly

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virulent strain of E. coli 157 that has been isolated in Germany and Cechoslovakia that is non-modal, and based on our experience we predicted it would have a mutation of the same gene that we find in these others. One is in collaboration with Peter Fang at the F.D.A., that that's certainly been the case, and have actually reconstructed that mutation, and its kind of the gold standard pathogen, and have been doing animal studies that show that they don't colonize the rectal anal junction of cattle when they are missing the flagella. It seems to be important in adherence in the early stages of infection.

Q. Now, these other functions that you described, other than swimming, are all the proteins of the flagellum necessary to perform these other functions, or are they seldom involved in these other functions?

A. The flagellum can interact with receptors on the surface of host cells and they could be paralyzed in terms of you could have loss of flagellum function, but as long as those proteins are displayed on the surface, they can adhere and interact with that receptor protein, that recognition.

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Q. So for these alternative functions only some of the proteins are required; is that correct?

A. For that alternative purpose, yes.

Q. Doesn't that support the hypothesis -- the suggestions or hypotheses that some scientists have made that the flagellum evolved via -- the first cell in the proteins evolved from one and then --

A. No, that's a gross conjecture, okay? I think that adherence properties are, you know, indirect functions of the flagella, that there are protein protein interactions that occur by chance and, you know -- but the flagella wasn't an original, aboriginal structure to allow it to attach to some surface.

Q. Have you done any experiments or empirical studies that would conclusively rule out that possibility?

A. It would be tough to rule it out. It's in interpretation. I mean, it's really an interpretation of the data and your perspective in terms of where you want to go with it.

Q. Let's go to page one of your report, and you say --

Q. Can I go back to that question again?

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And this is where it is interesting in how evolution has this ability to explain everything.

There are organisms that can use a flagellum to a attach to host surfaces, okay? That's a dangerous interaction with the host, because the host has a whole set of receptors that are keyed to find certain patterns of bacterial systems or other pathogenic systems. There is what we call a toll-like receptor that will bind bacterial flagellum and induce the inflammatory response.

Other bacteria have sacrificed flagellum biosynthesis because it's a dangerous protein to display on the surface, and that's why we don't see it in Yersinia pestis, even though at one time it had the ability to make one, Shigella and now new strains of E. Coli.

So who is to say that, you know, the original function was to bind on the surface when you see organisms going in the opposite direction sacrificing motility because of that potential role that the host that they are infecting can mount of inflammatory immune response against them.

Q. Let's go on to page one of your report. You say, on page one, under sub-heading one, the

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second sentence under sub-heading one, "Given that even the simple cells are comprised of nano machines that currently defy our own intelligent capability to produce, yet have the general features of many machines we have made on a larger scale. Intelligent design theory is simply an inference to the best explanation as to the origin of this design."

Can you explain what you mean by inference to the best explanation?

A. Well, I mean, we use inferences all the time, right, in terms of explaining things. That's part of the definition of a theory, you can infer, you can make predictions.

The bacterial flagellum, as I have outlined in my expert report, is, according to the scientific community, a highly sophisticated rotary engine. It has all the hallmarks and components of engines that we have built, you know, Mazda engineers have built.

These are the products of highly intelligent design engineering. We find these on the scale that at this point we don't understand, of physics and chemistry, in which they operate. They self-assemble, they have an elaborate algorithm or

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genetic program that regulates their assembly.

You know, these are, because in our experience that we find such sophisticated machines, the product of intelligence, are we willing to say, infer, that unintelligent, undirected natural law is more creative than intelligent agents that build these things in the macro scale?

Q. Is what you describe as an inference, the best explanation, is that a scientific concept or is that –

A. It's a logical concept, it is logical.

Q. Do you have to be a scientist to make that type of inference or can just any lay person make it?

A. Some of these, I think, are common sense.

Q. So it seems like you are saying that these are really complex living systems and you are very skeptical about the ability of natural selection to produce these systems, and then you -- it seems from those two premises you go to the conclusion that the systems were intelligently designed, can you explain how you get from that premise to that conclusion?

MR. WHITE: Objection, I don't think that's a fair characterization, it's an overly

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complicated question, over broad, misstates prior testimony, et cetera.

THE WITNESS: I want to qualify what you said in the sense that nature can produce complex things, all right? You know, some people have ascribed evolution as, you know, a tornado going through a junk yard and assembling a fully functional 747, you know? A pretty rare event. But at the same time it can go through and disburse junk in a very complex unique pattern, and every tornado is going to give something different.

Complexity alone is not what drives me to this conclusion, it is specificity with it. Just complexity is only part of the equation. When I look at the bacterial flagellum and it has all the hallmarks of machines that are the product of intelligent design and the product of intelligent agents, then I can infer, because this is even more sophisticated, by our own admission in the scientific community, than anything that has been made by intelligent agents, that it, too, may be the product -- or at least we should consider that it may be the product of an intelligent designer. And that is a perfectly logical inference. And it is just in part common sense, too.

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Q. I believe you used the word specified, you said the complexity is specified?
A. Right, there is a pattern there that I can look from, an outside experience, you know? I can go to an engineer and show him the bacterial flagellum and all the parts that have been identified, and they know what a stator is, they know what drive shaft is, they know what a u-joint is, these are labels that we have assigned to these components and they have the same function in intelligently designed machines.
But these, again, are more complex. These machines self-assemble, these machines can -- are programmed by a genetic algorithm that is more complex than some of the engineering programs that -- or the computer programs that we have that are driving functions.
So, you know, what is the problem with even entertaining the idea that these machines, which again, Howard Berg has determined the most efficient machines in the universe, are the product of unintelligent chance and necessity?
Q. Is specified complexity a concept that is used in intelligent design theories?
A. It is.

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Q. Is it the same thing as reducible complexity or is it different?
A. No, no, it is different, it is looking at it in terms of how you identify design and natural systems. Complexity is one component. What is the probability that this can happen by chance? You know, if it is a small probability, it doesn't rule out that it is necessarily designed. If it is specified in the sense that there is a pattern that we can recognize outside of the system that we are looking at, then that's another component as well.
If we only find codes, you know, whether they are alphabets or mathematical symbols or musical scales, if we only find information storage systems as a product of design and then we look in systems and find that they are the most information rich systems in the universe that we know of, they have the most sophisticated information storage system that we know of, our context, whenever we have a code that bears information, is the product of intelligence, and we find a system more sophisticated in living organisms, then we can infer that it might be correct to assume there is an intelligence behind these organisms?
A. So if something displays irreducible

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complexity but not specified complexity, is it likely to have been an intelligent design or not?
A. I don't know -- I don't think I understand the distinction you are trying to make.
Specified complexity and irreducible complexity are two different concepts. Specified complexity means that you find something in a natural system that is similar to something we find in our own experience as intelligent agents. It doesn't necessarily imply that it is irreducibly complex.
Q. Now, on page nine you --
MR. WHITE: Page nine of what, Alex?
MR. LUCHENITSER: Oh, page nine of the report.
BY MR. LUCHENITSER:
Q. You say -- in the second sentence of the last paragraph you say, "In all irreducibly complex systems in which the cause of the system is known by experience or observation, intelligent design or engineering played a role in the origin of the system."
A. All right, I'm having a hard time finding it.
Q. Second sentence of the third paragraph.

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A. Okay.
Q. Now, is it the case that all irreducibly complex systems whose cause we know were ones that were designed by human beings?
A. That's the context in which I am looking at this, or intelligent agents.
Q. Are there any irreducibly complex systems that were designed by animals? How about insects, do insects create irreducibly complex systems, like a bee honeycomb or various kinds of ant hills?
A. That's a good question, I would have to think about it. I wouldn't call, say, a honeycomb or an ant hill an irreducibly complex system. You know, that's a structure that they are building that is a community for, you know, cohabitation, and I don't see the distinction. I would have to think about that.
Q. Is there anything you can think of that was not designed by a human and is not living that is irreducibly complex?
A. Irreducibly complex that is not --
Q. That was not designed by a -- that is not a biological system. Do you think the earth is irreducibly complex?
A. I mean, that's an extrapolation outside

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of my area, so, you know -- I mean, to me it is not --

MR. WHITE: Object, it is calling for an opinion beyond his expertise.

BY MR. LUCHENITSER:

Q. Let me see if we can take you a little down this road. The earth has bodies of water, land masses, it has the earth's crust, it has got the magma, it has the core, it has the atmosphere. If you remove any of those components, would the earth still be able to serve the function of a supporting life?

MR. WHITE: Same objection.

THE WITNESS: It's an inanimate object, I mean, it has no -- if we assign purpose to it, you know, at this point -- I mean, I don't see the point.

BY MR. LUCHENITSER:

Q. Can the theory of irreducible complexity apply to inanimate objects?

A. It's possible. I mean, there are environmentalists that certainly assume that, you know? The whole Gaia principle that the ecosystem is intricately coordinated and interdependent for the sustaining of life, and if we get in there and

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screw up the ozone layer that it is going to have consequences to biological systems.

Q. So if under that type of thinking you conclude that the earth is irreducibly complex, would that mean that the earth was designed?

A. Oh, I think you can make the inference that the earth has design in it, you know? And this goes in with the physics and the anthropic coincidences that the requirements for life are, you know, pretty well defined and rare to support life.

So, yes, I would agree the earth has the appearance of design for the support of life.

Q. On the bottom of page nine, the third paragraph, third sentence.

MR. WHITE: We are back on which exhibit?

MR. LUCHENITSER: If I don't specify a document, we are talking about the report.

BY MR. LUCHENITSER:

Q. You say that, "Given that neither standard neo-Darwinism nor co-option has adequately accounted for the origin of these machines, or the appearance of design that they manifest, one might now consider the design hypothesis as the best explanation for the origin of irreducibly complex systems in the living organisms."

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Now, is it correct that at one point science could not explain where any feature of the earth came from? For example, where oceans came from, where various geological features came from, such as the Grand Canyon, where land masses came from or where a mountain might have come from?

A. If you are thinking of in terms of tectonic plates and continental drifts, yes, before we had a concept of these ideas, it wasn't on the drawing board. And when it was introduced, it was a pretty radical idea that was met with a lot of opposition, now accepted as fact.

All I am saying here is that given our experience that these are complex specified systems, that their counterparts that we know from experience are the product of design or engineering, that we don't have the phylogenetic history of any of these machines that neo-Darwinism hasn't produced it, co-option, I think, is an inadequate explanation at this point, that everybody agrees that nature has the appearance of design, it can be real or only apparent, that it is a viable valid argument to say it is real design.

Q. Do you accept the theory of plate tectonics?

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A. Yes.

Q. Would you accept that mountain ranges are caused by two plates crashing into one another?

A. Sure.

Q. Now, before scientists developed the theory of plate tectonics, did the absence of that theory mean that mountain ranges were designed?

A. No, no, I think you could say they are the products of wind and erosion over time. I mean, there may be aspects of it that -- I don't know. I don't think by definition they have to be designed.

Q. Why does the absence of a complete and detailed evolutionary explanation of how certain biochemical systems were designed -- how certain biochemical systems developed mean that you can't scientifically say that they were intelligently designed?

A. I don't understand the distinction here. I think that's a false dichotomy. Let's talk about something I do know about. I don't know plate tectonics, I'm not a geologist, but I do know how new ideas in science can have a profound effect on how we act.

We are celebrating the hundredth year of Robert Koch's receiving the Nobel prize in medicine.

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all right? Author of the germ theory of disease. A radical hypothesis in medicine. Okay. The fact that microorganisms that we can't see without the aid of a microscope are responsible for all these infections and death in the world. When he isolated the organism that causes tuberculosis which caused the death of one of seven people in the eighteen-hundreds, the late eighteen-hundreds, he gave that lecture at the University of Berlin, not in the pathology department but in a different department, I forget which one. Because Verchow, who was the standard leading pathologist in the world, refused to believe the scientific theory of the germ theory of disease, okay? It went against ages of medicine as how it was practiced.

So new ideas -- what you are trying to get me to say is that, all right, our old perception in terms of intelligent design as a necessary component can be explained away by new information, at the same time, new theories, when they are presented -- I'm losing my train of thought because I'm getting tired. Let me back up.

A new theory in science is always going to by challenged at some level when it is going against the conjecture, the consensus of present day

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body of knowledge.

Q. Now, with this germ theory of disease, would it be correct that it became an accepted scientific theory when its proponents supported the affirmative evidence that the theory actually explained how the disease developed?

A. Right, right.

Q. But it seems here, and tell me what your response to this is, it seems that proponents of intelligent design are simply saying that there are problems with evolution but they are not presenting any affirmative evidence that in fact shows or explains that life forms were in fact designed?

A. That's changing. Like I said, it's a young theory and people are working on these questions. I think Bill Dembski has mentioned it in his expert report, which I have just looked at. The design proponents that are publishing in peer-reviewed literature, Doug Axe, as an example, in terms of protein structure enfolding sequence space, you know, that are looking at it from a design perspective.

You know, so we are at this stage, yes, where we are going to have to come up with the data, we are going to have to come up with the

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interpretations, we are going to have to come up with the supporting evidence that will persuade people based on that evidence.

But nonetheless, this is a human endeavor. There are people that went to their grave in the nineteen-hundreds, I'm sure, that refused to believe the germ theory of disease. There are people that refused to have their children vaccinated because they didn't agree with it, even though I think the evidence was overwhelming.

So once you have wed yourself to a certain set of ideas, theories, it is difficult to change those ideas. And, you know, this is a Kuhnsistan way of looking at things. You have paradigm shifts and scientific revolutions, and in part you have to let a generation of scientists die off so that you can get these ideas on the table with an unbiased group of people that are willing to consider them.

Q. Let's go on to the next sentence of your report, the fourth sentence on the bottom of page nine which says, "That we have encountered systems that tax our own capacities as design engineers, justifiably lead us to question whether these systems are the product of undirected, un-purposed,

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chance and necessity."

But now, is it correct that we can already genetically engineer some microscopic -- I mean, some other life forms?

A. We can modify organisms by genetic engineering.

Q. But we can't build one from scratch yet?

A. Right -- well, I mean people have in part synthesized a viral genome and introduced it into a cell and gotten viruses as progeny. But that's going on the template of what we know that genome is and just reproducing it chemically, and that's not creating life de novo, it is copying it and providing the environment in which it is allowed to replicate.

Q. So now if we some day figure out how to build more complex life forms from scratch, will that support the intelligent design theory or will that undermine the theory?

A. It's going to be a very intelligent process, so I think it would support it.

Q. How does the fact that we can't engineer such structures right now support the theory?

A. Because they are of such complexity and specificity that we don't understand how to do it.

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That's not to say that we won't do it at some point, but it is going to take a lot of intelligence and engineering to do it, right?

Have we made any machines that can self-replicate, a true touring machine in the Neuman sense? No. Have we made a true artificially intelligent system? No, but we have got pretty smart computers that are making, you know, decisions, but these are the product of intense efforts and intelligence.

Q. Now, are humans able to build bridges and create artificial lakes?

A. Yes.

Q. And are there also natural lakes and natural bridges?

A. Yes.

Q. And at one time was it the case that humans could not build bridges or create artificial lakes?

MR. WHITE: Objection, what do you mean by a bridge, a log across a steam?

BY MR. LUCHENITSER:

Q. Let's stick to artificial lakes, just to keep it simple.

A. I mean, how far back in history are we --

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recorded history? I think, yes, there is evidence that people have diverted water into reservoirs and used it for their purposes, or dug wells, or whatever. What do you call a pond, what do you call a lake? It's an intelligent process, you know?

In terms of -- now, can you distinguish between a man-made or a naturally causing lake? It may be difficult, but I think you probably could.

Q. I guess that gets us into the next line of questioning. What kind of scientists attempt to determine whether something was designed by an intelligent cause or not, other than intelligent design theorists?

A. I think that's a component of several disciplines. Forensics, is one I can think of off the top of my head. Anthropology, you know? I think I mentioned before the SETI project.

Q. Do you have any expertise in how forensic scientists or anthropologist or SETI scientists attempt to determine whether objects were designed by intelligent actors?

A. I don't know if you are specifically talking about objects, but in terms of events, you know, objects or information for a SETI scientist, yes. I mean, they have -- they are looking for,

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again, complex specified information. It is illustrated, I think, in Contact that Sagen wrote.

Q. Do you have any expertise in SETI science?

A. No.

Q. What about anthropology or forensic science?

A. No. In forensics, I mean, some of the techniques I use, forensic scientists use in terms of preliminary chain reaction, DNA sequencing, restriction enzyme profiles.

Q. Now, when a forensic scientist or an anthropologist considers whether something was designed by a human, do they consider what abilities humans have?

A. Right, in terms of, you know, intelligent agents and experience.

Q. Do they also consider what technological knowledge or abilities were available to potential human designers at whatever time the object may have been designed?

A. Again, for me this is kind of speculative. But, yes, I think that's part of an intricate aspect.

Q. I mean, do they consider what materials

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were available to the human -- the potential human designers at the time the object was designed?

A. Yes.

Q. And do they consider what motivations the potential human designers might have had?

A. I don't know, I don't know. That's speculation, whether that's part of their discipline or not.

Q. Do they consider the question of how the humans could have achieved the design of the object they are looking at?

A. Yes, I think if you look at the -- I mean, as an example, in Florence, the Dome of the Chapel, that was a pretty complex engineering feat and there weren't any records left in terms of how that was made, or Stone Henge, where did those materials come from, how were they moved, how were they constructed?

Q. Now, is intelligent design theory able to consider any of the factors that we have just listed that anthropologists or forensic scientists consider?

A. In terms of motivation or --

Q. Yes, the factors or abilities, technological possibilities, what materials were

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available, what the motivations were and how the design could have been achieved?
A. Not at this point. I don't want to speculate. I mean, we can look at what materials are available, certainly, in terms of what differentiates inorganic from organic. In terms of motivations of designer, I mean that's speculative. If it's a product of designer creation, what motivates any creative act?
Q. And when anthropologists and forensic scientists are looking at or trying to figure out what an inanimate object was created by human behavior, they are able to rule out the possibility that it was created by a self-replicating non-human system; is that correct?
A. I don't know what you mean by a self-replicating non-human system.
Q. That's much more confusing than the way I could have asked the question.
They are only looking at inanimate -- they are not looking at living biological forms, they are looking at physical objects; is that right?
A. Anthropologists, yes. And so you can ask the question, based on my experience can wind, sand, and erosion produce this rock or is it the product

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of engineering? Whether it's an arrowhead or a carving, or something like that. Yes, you can infer.
Q. And an anthropologist or forensic scientist is trying to determine whether something was created by a human, they have other things that were created by humans to compare with, right?
A. Right.
Q. And does intelligent design have any life forms that we know for sure were created by an intelligent designer to make a comparison with?
A. Again, it's the inference in terms of what we have intelligently made that show homologous structures with things that we are finding in living systems. We have codes, we make codes, we find a code inherent in all organisms. Our experience tells us that codes, alphabets come from intelligence.
If we find one that is much more sophisticated, I infer there is an agent. Molecular machines that nobody anticipated 20, 30 years ago that are more sophisticated than our intelligent engineers can build, I can infer that, yes, this has inherent design in their construct.
Looking at nature there is -- again,

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nobody argues with the fact that there is design present. It boils down to is it real or is it just apparent? Can natural law produce it?
And I think -- look at it this way. The stakes have increased. The complexity and specificity of the cell is orders of magnitude above what we thought 30, 40 years ago, you know, well beyond what Darwin ever considered. The mechanism to produce that change has remained fairly static. mutation, natural selection.
Is it wrong then to ask that because we don't have any new mechanism now to account for this unanticipated complexity in these systems that there may be something else at play. The natural alone is insufficient to explain it. Those are valid questions.
And we are still stuck with mutation, natural selection, throw a little lateral gene transfer in there, but we have got some stuff that we didn't know existed 30 years ago, you know? It is equivalent to whoa, you know? The galaxies are expanding. We thought it was a static universe.
What does that imply? Are we right? Should we go back and reexamine our initial assumptions? Are we going to stick to the same

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consensus mechanism that has been under contention for the last 120 years?
Q. But now, isn't it the case also that over the last 30, 40 years our knowledge of evolutionary pathways and evolution theory has also increased?
A. Go back to Carl Woese's article. Simon Conway Morris's article, you know? We can account for the appearance of novel information at this point. Look at the beginning of Simon Conway Morris's article in Cell. The only real consensus is evolution happened. We don't have mechanism. Everything else is in contention, all right? Because we have to deal with molecular clocks and fitting them with geological time scales and they are not in synch.
I mean, these are things that weren't anticipated 20, 30 years ago. And these are things that are being debated in the scientific community and I don't think they are adequately being presented to -- no, I won't say -- I'll leave it at that.
Q. Would you agree that in the last 30 to 40 years evolutionary theory has made considerable progress in presenting hypotheses and potential explanations as to how complex molecular biochemical

systems could have evolved?
A. It has been a major component of evolutionary science and I don't think it has been that successful in the sense that we still can't come up with a mechanism where phylogenetic history of how one of these macromolecular machines evolved, okay? We have a lot of just-so stories, we have a lot of of icons and speculations. Do the experiment, get an evolutionary book -- an evolution book and look at the evolution of genomes, how much is fact, how much is speculation and conjecture?
You can do that experiment, you know? Just like this other paper by Blair, this might -- we can conjecture. There is a lot that we don't know, and I think we are in some part errant in presenting this idea that the evidence is overwhelming when amongst ourselves we are debating these issues.
I wouldn't be here, you wouldn't be here if my position wasn't being taken seriously by the Ken Millers and other people in biology. It wouldn't be in Time magazine, it wouldn't be in Wired magazine, it wouldn't be addressed by National Geographic. If we are flat-earthers, nobody would give us the time of day.

Q. Do you think the Ken Millers and other major pro-evolution scientists are responding to intelligent design theory because they think it's science theory or just because the work of intelligent design theorists has gotten considerable public attention?
A. I don't want to speculate in terms of what their motivation is. I think we have scientific arguments that are valid, they are on the table, they are in opposition to some basic fundamental tenants of evolutionary biology and we are hitting some hot buttons.
Stephen Jay Gould is going to come out and write a four-page article in Scientific American reviewing Phillip Johnson's book, a lawyer that is not a scientist, back in the early nineties, why, unless he is making valid points. You bring out the heavy guns when you are taking fire, otherwise you ignore it.
Q. Can biologists distinguish human engineered life forms from non-human engineered ones?
A. Please repeat the question.
Q. Can biologists distinguish life forms that were engineered by humans practicing genetic

engineering from life forms that were not engineered by humans who were conducting genetic engineering work?
MR. WHITE: Object just because it is very confusing.
THE WITNESS: I mean, if I modify Escherichia coli or Yersinia by adding new genetic information and ask -- you know, give that to 20 scientists, are they going to be able to tell if this phenotype is something that I modified versus something that is natural? I'm not necessarily sure.
I mean, we are taking natural genetic information that is already present or cutting and splicing genes from different systems making fusion proteins that, you know, we may not have seen before and asking can someone tell the difference? I don't know.
(Recess taken.)
BY MR. LUCHENITSER:
Q. Can you explain what a peer review journal is?
A. A peer review journal is one in which you submit a manuscript to the editor, the editor will usually read the abstract or look at the title and

determine whether or not, you know, it is worthy of publication. If he thinks it is an interesting topic or it fits with the scope of their journal, he will identify experts in the area, usually from my experience three to five, copy the paper, send it out to them, have them read it, criticize it, determine whether or not it is worthy of publication or not, or worthy of publication with certain modifications, and then send it back.
Q. Are articles in the conference proceeding volumes generally considered to be peer reviewed?
A. Not with the same rigor that normal peer reviewed journals are. If you are referring to Design and Nature, that was reviewed by scientists, but not on the same level as the meeting. So, you know, people look at meeting or symposia, publishing from those with a little bit different view in terms of the rigor in which they have been reviewed.
Q. So we are talking about the 2004 article wrote Mr. Meyer there which you quote in your report on page nine; is that correct?
A. Right.
Q. And so you would not characterize that article as peer reviewed?
A. Not on the same level as I would from

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papers I have in the Journal of Molecular Microbiology or Journal of Bacteriology or the proceedings of the National Academy of Science. They are not under the same constraints.

What makes one point interesting is that this is in a meeting referred to now as biomimetics. Engineers, architects are coming to biologists because they recognize biological systems have solved some pretty sophisticated complex problems in structure and engineering. So they are coming to us, intelligent engineers are coming to biology to ask how these problems were solved in this interface.

Engineers are interested in the flagellar motor because it is a true nano machine and they recognize it has a lot of potential and applications to systems they can develop.

So I think it is somewhat ironic that intelligent engineers are looking to products of non-intelligent chance and necessity of how did you do this?

Q. You have published a number of articles reporting the results of research you did in scientific peer-reviewed journals; is that correct?

A. Yes.

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Q. Can you tell me why you decided to publish these articles in the peer-review journals? MR. WHITE: I'm sorry, did you ask --

BY MR. LUCHENITSER:

Q. Can you tell me why you decided to publish the articles in the peer review journals?

A. That's my job. To get funding I have to produce. That's judged by not only the number, but the quality of publications that are generated.

Q. Have you ever served as a reviewer for any peer review journals?

A. I have ad hoc review, I have been on grant review panels as well that have as rigorous peer review process.

Q. And which journals are considered the most prestigious in the biochemistry area or molecular biology?

A. Cell, Journal of Molecular Biology, Proceedings of the National Academy of Science, Nature, and my own sub-discipline, Journal Bacteriology and Molecular Microbiology, Journal of Biological Chemistry, those are -- I can give you a whole list, if you want.

Q. Have you ever published any articles in

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any peer review journals, any articles discussing intelligent design in any peer review journals?

A. I mean, we just alluded to that before. I think a lot of the results that I have have implications for intelligent design, but they are not papers that are published specifically supporting that position. Consider -- well, I'll leave it at that.

Q. So you have not published any articles in a peer review journal that actually discusses intelligent design -- any articles that actually discuss intelligent design?

MR. WHITE: That's mischaracterizing what he just said.

BY MR. LUCHENITSER:

Q. Is that's correct?

A. There is one 2004 paper.

Q. The Minnich/Meyer paper?

A. Right, and that's minimally peer reviewed, but it was reviewed by scientists and, you know -- but Alex, I'm not stupid, you know? I'm not stupid. There is not an open avenue for this.

Steve Meyer, I'm sure you are well aware of, got one through a journal that has a citation indices of, you know, just barely on scale, it's a

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journal that nobody reads, purporting intelligent design, and the results were -- the editor was threatened with loss of his job, they wanted to know who the reviewers for this paper were in a journal that is inconsequential.

So when you criticize me for not producing peer reviewed journals on intelligent design, there is a reason for it, you know? There are risks involved in terms of the consequences.

Peer review works both ways. It keeps junk out, but it also traditionally has kept novel new ways of looking at things out as well. Okay? Anything that doesn't mesh with the consensus is going to cause a problem, especially with this implication.

Q. Have you submitted any articles that explicitly discuss intelligent design to any peer reviewed journals?

A. No.

Q. And can you tell me why not?

A. I just told you why.

Q. But people already know you are an intelligent design proponent; is that correct, people in the community?

A. In my people that -- you know, in my

department, yes, at this university they know where I stand.

Q. Do you think people in the general scientific community know, people who read these journals?

A. I don't know.

Q. So you think you might have some -- you might lose standing in the scientific community by submitting articles advocating for intelligent design to a peer reviewed journal?

A. That looks like the way it is.

MR. WHITE: Object to the phrasing of that question.

BY MR. LUCHENITSER:

Q. But you are not worried about the publicity you might get, either serving as an expert in this case or from your speaking?

A. You bet I am. There is a real risk involved here, and don't minimize it, you know? Ken Miller can do this same thing and be supported by the consensus community. I am taking a real risk.

MR. LUCHENITSER: Could you mark this as exhibit whatever it is?

(Deposition Exhibit No. 11 marked for identification.)

MR. WHITE: Do you have an extra copy?

MR. LUCHENITSER: Oh, sure.

BY MR. LUCHENITSER:

Q. We have marked as Exhibit 11 the article entitled Scott Minnich and Stephen Meyer, Genetic analysis of coordinate flagellar and type III regulatory circuits in pathogenic bacteria.

And is this article the one you have been referring to several times, your article concerning intelligent design published in 2004?

A. Correct.

Q. Can you tell me which part of the article you drafted and which part Mr. Meyer drafted?

A. I essentially wrote the entire paper when I was on sabbatical with the Iraq Survey Group in Baghdad in 2004. Steve and I had discussed at length the implications of the bacterial flagellum as a model for intelligent design. I roughed out the philosophical implication section and e-mailed it to Steve.

I also had him look at the rest of this and, you know, go over it for general content and clarity. But he revised part of the philosophical implications. He is a scientific philosopher, and that was our collaboration on this.

Q. After he revised it did he give you a chance to edit it?

A. Yes. I want to say one thing, too, in light of this. Like I said, I was on sabbatical in Baghdad. This was a risky paper for me to write. I thought about just leaving out this last section, okay? because of the implications and being, you know -- coming out in print. But I believe it, but I have a family to feed.

The night I was writing this, you know -- this is just incidental, you know, we took nine mortar rounds right on top of our position, and I thought, I don't care, you know, I might not be here tomorrow, hit the send and off it went and I was committed.

Q. Did your service in Iraq in any way affect your thinking about intelligent design theory?

A. No, no. It gave me a different perspective of life, though.

Q. Has any journals ever asked you to publish or to submit an article to them on the subject of intelligent design?

A. No.

Q. Have you ever served as a peer reviewer

of any articles relating to the subject of intelligent design, that explicitly discussed intelligent design?

A. For peer review journals or -- I'm trying to think. I reviewed a couple of Mike Behe's papers in the past, you know, that have gone into -- I'm not sure which journal it went to, Journal of Theoretical Biology, or something like that. And Doug Axe's paper I was privy to before it was published. And that is an intelligent design paper, but laid kind of between the lines, not explicitly, but that was its impact.

Q. Behe's paper you were referring to, were those published in peer review journals?

A. I'm not sure, it has been a while ago. Some of journals I'm not familiar with or venues of publications, and even the ones that I have read, if they eventually were published, I don't know.

Q. Are you aware of any articles published in peer review journals that explicitly advocate in favor of theory of intelligent design?

A. Yes, Steve Meyer's paper and the Smithsonian Journal, the Biological Society of Washington D.C., you know. That was a fire storm.

Q. You say is that the only one?

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A. Doug Axe's papers that are in the Journal of Biological Chemistry, I think.
Q. Is there anything else?
A. There may be some, I'm not sure, in terms of what my colleagues are doing. It's a pretty loose affiliation. I mean, I don't have time to interact with these people all the time.
Q. You said that Doug Axe's -- did you say before that his work didn't really explicitly discuss intelligent design or was just kind of in between the lines, or what?
A. You mean from my conversations with Doug?
Q. So the articles he had in peer reviewed journals that were published, were they articles that explicitly advocate for I-D, intelligent design, or just stuff that kind of -- articles that implicitly --
A. They have an impact in terms of how we interpret sequence phase and protein folding, but I think they are more consistent with an intelligent design perspective than Darwinian, okay?
Q. Have you ever received any grants to work on -- to do work in the field of intelligent design theory?
A. No.

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Q. Can you tell me which individuals have provided the content of the intelligent design theory?
MR. WHITE: Objection as to what do you mean by content?
MR. LUCHENITSER: The specific components of whatever intelligent design theory.
THE WITNESS: You mean who are the people that are really leading this area, this field? Yes, Steve Meyer, Bill Dembski, Paul Nelson, Mike Behe, you know, those are -- I mean, you have a stack of their books there.
BY MR. LUCHENITSER:
Q. Would you include yourself among those people?
A. Not in the front line. I mean, that's not my primary focus and my scientific endeavor. I am a research microbial geneticist, I study pathogenesis, that's what pays the bills, you know?
Q. Have you developed any specific elements of the intelligent design theory?
A. In a consulting aspect, you know, in terms of irreducible complexity of the bacterial flagellum is a paradigm for intelligent design.
Q. Is it correct that you a fellow of the

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Discovery Institute's Center for Science and Culture?
A. Correct.
Q. And is the Discovery Institute's Center for Science and Culture recognized as an authority on intelligent design?
MR. WHITE: Objection, recognized by whom?
BY MR. LUCHENITSER:
Q. Generally recognized by people in the intelligent design community?
A. Yes, I mean that's a think tank where a lot of people have associations.
Q. Were you awarded like a specific fellowship for specific time period?
A. No, no, I mean, it's a pretty loose affiliation. I don't know -- you know, I agreed to be a fellow and they put my name on a list.
Q. So they didn't give you a project or any money, or anything like that?
A. No, no. In fact, that's an area of contention I have with Robert Pennock, because when he came here, he informed the biology faculty upstairs that I was on the Discovery Institute payroll and I was receiving $47,000 a year, that I

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was running a haven of graduate students in intelligent design, which blew me away.
I have never been on the payroll of the Discovery Institute, and how an individual can come on this campus and accuse me or foment this conspiratorial perspective. I mean it just -- you know, he is an expert witness, and boy, if he performs with that same amount of integrity in his general work, I have a problem with it.
Q. Can you tell me what you do in your capacity as a fellow for the Discovery Institute Center for Science and Culture?
A. I have no job description. I have never been given any assigned tasks. Occasionally I am called up and they say, "Will you review this?" Or, "Do you want to -- what do you think about this?" More as a consultant.
But it is pretty minimal, you know? I am good friends with Steve Meyer. But in terms of a defined job description or what it means to be a fellow, no.
Q. And are you familiar with a document called The Wedge Document?
A. I have never read it. I am familiar with it. What I have have read about it is, you know,

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what other people have said about it.
MR. LUCHENITSER: I will ask you to mark this.
(Deposition Exhibit No. 12 marked for identification.)
BY MR. LUCHENITSER:
Q. We have marked as Exhibit 12 a document called The Wedge Center for the Renewal of Science and Culture, Discovery Institute. And I am going to ask you to flip to -- okay, this says page two up here, it might be page four of the document?
A. It's got this table?
Q. Yes, there is a table with three columns and --
MR. WHITE: I also object on the grounds of foundational identifications. Professor Minnich said he has never seen this thing and doesn't know about it.
BY MR. LUCHENITSER:
Q. Where it says, "Goals, governing goals," in the first column, and the second goal listed is, "To replace materialistic explanations with the theistic understanding of nature and human beings are created by God," do you agree with that goal of The Wedge document?

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MR. WHITE: Objection, this is -- you are asking about Discovery Institute's alleged document here.
MR. LUCHENITSER: I just want to know if Dr. Minnich agrees with that goal.
THE WITNESS: Which one are you asking about?
BY MR. LUCHENITSER:
Q. The second goal listed in the first column.
A. "To replace materialistic explanations with the theistic understanding that nature and human beings are created by God." That's not part of my agenda, you know?
Q. Do you think that's a worthwhile goal to pursue?
MR. WHITE: Objection.
THE WITNESS: That's a loaded question. Turn it around, and, you know, Richard Dawkins and Dan Dennett have an agenda to, you know, replace religious belief with a materialistic viewpoint of the world, is that not legitimate? I mean, they are driven by their world view and they want to see it adopted. Other people have a different position, you know. I don't think there is anything

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inherently wrong with this.
Q. Is it a goal of yours or is it not relevant to what you are doing?
MR. WHITE: Objection, asked and answered.
THE WITNESS: No. I mean, my goal in life is to do science, be a father, pay my bills, be a contributing citizen. I am a Christian and with that comes holding Christian tenants and doctrines. There is a commandment in terms of evangelism or defending your position, but I am not a missionary.
BY MR. LUCHENITSER:
Q. Now, are you aware that the Discovery Institute has issued a press release that is critical of the actions taken by the Dover School District that led to this lawsuit?
A. I haven't seen it.
Q. Okay, I'll give you a copy of it.
A. Okay.
(Deposition Exhibit No. 13 marked for identification.)
BY MR. LUCHENITSER:
Q. Okay, we have marked as Exhibit 13 a document called: Discovery Calls Dover Evolution Policy Misguided. Calls For Its Withdrawal.

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And if you could read the first two paragraphs of that press release and let me know if you agree or disagree with the opinions expressed by the Discovery Institute.
MR. WHITE: And I will object to the lack of foundation, no showing of authenticity, and you are asking him to go into the head of the Discovery Institute.
BY MR. LUCHENITSER:
Q. I just want to know if you agree or disagree with any of the positions expressed there.
A. I'm not a policy expert so that's not my area, it's not my expertise so I don't want to comment. So that's my answer.
I will say that from the viewpoint of the Discovery Institute and my own personal opinion, intelligent design is not -- should not at this point be part of any curriculum in a public school.
Q. So you do agree with that, that it should not be a part of the curriculum?
MR. WHITE: Objection, that's not what this paragraph is saying.
THE WITNESS: That's not what this is saying. I am just saying, you know -- and they are not -- the Dover -- from my understanding of the

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Dover School Board, they are not saying that they are going to incorporate intelligent design into their curriculum, they are going to teach the state board requirements in terms of Darwinian evolution, and that's what they should do.

I haven't talked to anybody on the school board and I am not aware of the motivation for the policy that they have written.

Q. Are you a member of any other organizations?

MR. WHITE: Time out. Exhibit 14 is withdrawn now?

MR. LUCHENITSER: I didn't have it marked.

MR. WHITE: I'm sorry.

BY MR. LUCHENITSER:

Q. Are you a member of any other organizations that are in any way involved with intelligent design theory?

A. Yes, I think I am. Bill Dembski has a society of -- I don't know what they call it, but they asked me if wanted to be a fellow and put my name on that as a member, and I have, but I have never -- I mean, I've never done anything or gone to any meetings or participated in any discussions.

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Q. Have you ever read the book: Of Panda and People?

A. I have skimmed it.

Q. Do you know which edition you skimmed?

A. The 1993 edition. I think that's the last edition, right?

Q. Do you understand that to be the edition that has been made available to students the Dover School District?

A. That's my understanding.

Q. So you didn't read the whole thing?

A. You know, I skipped through -- I have skimmed the whole book. I know what the contents are, basically.

Q. Do you believe the book to be an accurate presentation of the intelligent design theory?

A. Yes and no. I mean, again, contextually this was written in 1993 and things were just getting off the ground at that point in time. So it is outdated, as any textbook would be that is a biology textbook because of just the rapidity in which data is collected. But the basic arguments, I think, stand in terms of alternative views of looking at the basic principles of it.

Q. Is there anything in the book you believe

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is incorrect?

A. I'm sure any textbook has inaccuracies in it. I don't know of any specifics.

Q. Are you aware of a new textbook under development called: The Design of Life?

A. I just heard about it in the context of, you know, this lawsuit.

Q. Do you have any role in the development of: The Design of Life?

A. No.

(Deposition Exhibit No. 14 marked for identification.)

BY MR. LUCHENITSER:

Q. We have marked as Exhibit 14 a document entitled: Dover Area School District News, Biology Curriculum update, and I want to ask you to flip to page two of this newsletter document and read the third paragraph of the first column which starts with the words, "In simple terms on a molecular level scientists have discovered a purposeful arrangement of parts which cannot be explained by Darwin's theory. In fact, since the nineteen-fifties advances in molecular biology and chemistry have shown us that living cells, the fundamental units of life processes, cannot be

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explained by chance."

Do you agree with that statement?

A. In part. You know, I think this is written for the lay public. You know, I would qualify some of these.

Q. Do you think the statement is too strong?

A. Yes, I mean it's -- I mean, it has a flavor of an absolute and I hesitate -- you know, I wouldn't have written it like that.

Q. How would you qualify the statement?

A. I wouldn't use words like, "Have discovered a purposeful arrangement of parts which cannot be explained by Darwinian theory." I would say when you have -- as I have mentioned before, we have discovered macromolecular machines that all of us agree are pretty amazing that we didn't anticipate, and this throws a new light in terms of Darwinian mechanism to produce them, and they need to be reevaluated -- or our consensus viewpoint needs to be reevaluated.

Q. Do you think the statement could mislead its readers about what the current state of scientific knowledge is?

MR. WHITE: Objection, calls for speculation.

THE WITNESS: I mean, that's speculative, I don't know how the lay public -- I don't know who this is written for or what context -- I mean, is it the newspaper article? Is this a --
BY MR. LUCHENITSER:
Q. Actually, it's Dover Area School District News, so this -- I believe it is made available to both students and parents in the school district.
MR. WHITE: I will just object to lack of foundation showing authenticity, especially since Professor Minnich hasn't seen this before.
THE WITNESS: Right. I mean, there is no, you know, title in terms of journal or publication that this is present in.
BY MR. LUCHENITSER:
Q. That's all right, we can establish that elsewhere at trial.
But would you, from your standpoint as an educator, would you support the making of this statement I quoted to high school students?
A. This one here?
Q. Yes.
A. Not as it is written.
(Deposition Exhibit No. 15 marked for identification.)

BY MR. LUCHENITSER:
Q. We have marked as Exhibit 15 a document called: Intelligent Design. It's in an article that was published in Touchstone by Dembski called: A Primer on the Discernment of Intelligent Design.
And if you could flip through the last page of this article and look at the last paragraph, I am just going to read you the paragraph and ask you if you agree or disagree with this.
It states, "The world is a mirror representing the divine life. The mechanical philosophy was ever blind to this fact. Intelligent design, on the other hand, readily embraces the sacramental nature of physical reality. Indeed, intelligent design is just the Logos theology of John's Gospel restated in the idiom of information theory."
MR. WHITE: Also object, you are having him take this paragraph out of context of this article, which is about 11 pages long which he has never seen before.
THE WITNESS: Yes, I haven't read this article.
This is Journal of Mere Christianity, this is a Christian publication written to a defined

audience. "Mechanical philosophy was ever blind to this fact. Intelligent design, on the other hand, readily embraces the sacramental nature of physical reality."
I'm not really sure what that means, "just the Logos theology."
"The world is a mirror representing the divine life."
It's a question of semantics, but I think this is consistent with Christian doctrine. Again going back to Romans, Chapter One, I mean it says that God has revealed Himself in what has been created. It is clearly evident, his attributes.
Traditionally, Christian theology has looked at nature as a second set of scriptures, and this is really, I think, reforming what that says, that we can learn about God from the study of nature. This has been a motivating force even in the development of science as we practice it today, agreed to by secular historians and scientists.
So in one sense I don't have a problem with this. "Intelligent design is just the Logos theology of John's Gospel," I assume he is referring to that: In the beginning was the word; in the beginning was information. That's consistent with

an intelligent design perspective with, I think, our view of the world.
Q. I want to read you a quote by William Dembski, which is, "Any view of the sciences that leaves Christ out of the picture must be seen as fundamentally deficient." Would you agree with that?
A. I don't know the context of what he is stating.
MR. WHITE: Do you have the actual written statement from The Lookout?
BY MR. LUCHENITSER:
Q. Let me show it to you.
MR. WHITE: Do you want to mark that as an exhibit?
MR. LUCHENITSER: Yes.
(Deposition Exhibit No. 16 marked for identification.)
BY MR. LUCHENITSER:
Q. Exhibit 16 has been marked as: William Dembski, Intelligent Design, The Bridge Between Science and Thrology.
We are looking at page 206, the first full paragraph, the first sentence of the paragraph starting with words, "If we take seriously."

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MR. WHITE: And again, I will just object, that you are asking Professor Minnich to comment on a sentence out of a multi-page article he has yet to read.
BY MR. LUCHENITSER:
Q. I'm just interested in Professor Dembski, whether you agree --
A. Yes, Bill Dembski is a trained philosopher and has theological training as well as mathematics. I am neither -- I think that -- Chalcedon --
So that any view of the sciences that leaves Christ out of the picture must be seen as fundamentally deficient. Is that the main point that --
Q. Yes, the question is, do you agree with that or disagree?
A. I would have to think about it. I mean, I don't know the theological context that he is drawing in this. I think -- I would have to think about it, I'm not sure.
Can I make a point? Again, in terms of contrast. If that is seen as a problem, you contrast that to Depchamski's quote, "Nothing in biology makes sense outside the light of evolution."

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I mean, that's a pretty dogmatic statement, too. There are materialists that say, "Any other than a materialistic viewpoint of nature is fundamentally deficient."
In one sense I see this as the antithesis of statements that are coming out from a materialist's world view. So in that respect, it's a legitimate statement.
Q. I am going to read you a quote from Paul Nelson, which I don't know if we have it here or not, but I am going to at least ask you to assume he said it.
MR. WHITE: Just for this whole line of questioning, I just object on the basis of relevancy.
BY MR. LUCHENITSER:
Q. Tell me if you agree or not. There is a quote from Paul Nelson from Touchstone Magazine that refers to intelligent design, and the quote is, "We don't have a theory of biological origins, just motions and intuitions." Assuming he made that statement, would you agree or disagree with that?
A. Similar evolutionists have made statements like that. I mean, that has been a criticism, my own self-criticism within the

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scientific community, is that we have just got a body of just-so stories. You know? And that's a problem that is recognized, that, you know, there is a lot of conjecture and speculation.
There have been -- you know, James Shapiro has said that as well. I think it is implied in Carl Woese's review article that I provided in my expert opinion.
Q. But do you think that statement would be an accurate description of intelligent design theory?
A. Read it again. Again, I don't know the context.
Q. Let's forget about the context, because I am going to be asking you these things without quotes.
Would you agree with the proposition that intelligent design does not have a theory of biological origins, just notions and intuitions?
A. Theory of intelligent design?
Q. Yes.
A. In terms of origins, specifically origins, is that what Paul is saying?
MR. WHITE: Would you have him read it?
THE WITNESS: I don't want to speculate

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on something that I don't know the context in which it is being written
BY MR. LUCHENITSER:
Q. Would you agree with the following statement, "Intelligent design means that various forms of life began abruptly through an intelligent agency with their distinctive features already intact: Fish with fins and scales, birds with feathers, beaks, and wings," et cetera?
A. Not completely, you know? No, no. I mean, I think that's a pretty general statement in terms of --
Q. Tell me if you agree or disagree with the following statement, "Who or what were man's ancestors? The fossils surely don't give us any conclusive ancestor. Darwinists are convinced that homo erectus was nearly human and directly ancestral to man. Design adherents, however, regard homo erectus as well as other hominids in a discussion of human ancestors as little more than apes and point instead to the abrupt appearance of the culture and patterns of behavior which distinguish man from apes."
MR. WHITE: I also object unless you let him read that, it's unfair.

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THE WITNESS: You are asking me if I agree with that statement?
BY MR. LUCHENITSER:
Q. Yes.
A. Not completely. I'm not a paleontologist, I'm not an expert in human evolution. I do find it interesting, though, that every time a new fossil is found, you know, the general way in which it is presented is that, wow, you know, we have got to go back and rewrite the evolution of man, whether it is these new fossils that were found in Micronesia, these new contributions, all that tells me is that every time a new set of fossils are found that require a modification of human evolution is that we don't know a whole lot about it, okay?
Q. Let me ask you if you would agree with the following statement, "Design proponents point to a role of intelligence in shaping clay into living form."
A. You know, again, I don't know who wrote this or what context it is. Salvador Luria, who is a Nobel laureate at M.I.T, you know, in terms of his hypotheses of the origin of life, incorporated the idea that clay was the matrix on which original life

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replicating forms originated. So even non-intelligent design people look at clay as playing a role in origins of life, okay?
Now, if that is taken right out of Genesis in terms of, you know, God molded dirt or clay into a human form, I don't know if that is a literal interpretation. I think in the general sense, since we are made of the same components of the earth's crust, that it serves a purpose, that it is not inconsistent with the idea that the designer used materials that are available. But did he just pick up a piece of clay and mold, you know, the first human? I don't know.
Q. Let's get the context. Do you have the book?
I am going to show you -- this is a copy of the 1993 edition of Pandas and People.
A. Okay.
Q. I assume this is a book you want to keep and not lose.
(Off the record.)
MR. LUCHENITSER: Is it okay if we don't mark this as an exhibit?
MR. WHITE: That's fine. It's Pandas and People, Second Edition, 1993; is that correct.

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MR. LUCHENITSER: Yes, we are looking at the 1993 edition of Pandas and People.
BY MR. LUCHENITSER:
Q. If you could flip to page 77. And the quote I read, "Design proponents point to the role of intelligence in shaping" -- somewhere on that page, maybe you could help him find it.
(Off the record.)
THE WITNESS: Yes. I mean, in the context of this, you know, it is a looking at ancient myths in terms of -- let me just read it.
"A common explanation of origins in most ancient cultures was creation by the Gods. On closer inspection we see most of these ancient creation myths were personifications of nature. Even so, in the same data from antiquity, modern views of intelligent design and macro evolution find their ancient roots."
Okay, intelligent design and macro evolution find their ancient roots.
"Design proponents point to the role of intelligence in shaping clay into living form. Evolutionists, on the other hand" -- and this is Salvadore Luria that I mentioned before, and Karen Smith, "point to the clay itself as the stuff of

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which life is spontaneously generated by nature, stuff, which most of the time, was personified as a god. Those two alternative concepts of origins does have long histories extending from ancient times to the present."
Earth material is the essence of human beings.
Q. So is it your opinion that that statement that you just read accurately reflects intelligent design theory?
A. I think it is an accurate representation in terms of how we view the origin of life and man from both sides, that clay is an integral part. It is interesting that this is also in ancient myths that, you know, anthropomorphise nature.
Yes, so I think they are just pointing to commonalities in the role of inorganic as a source of life.
Q. Have you ever been retained as an expert witness in litigation before? Have you ever served as an expert witness?
A. No.
Q. Have you ever testified about intelligent design theory or about evolution in any kind of public context, such as before legislative body or

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before a school board or administrative body?
A. From a private school board. I mentioned before, when they were reviewing -- from a local Christian school that was reviewing their biology curriculum. On my recommendation they incorporated Ken Miller's book and this book as well and got rid of their -- I think it was Bob Jones University curriculum that I thought was, you know, just over the edge.
Q. So they incorporated both Ken Miller's book and Of Pandas and People as --
A. Ken Miller's book as their primary biology text. This is what I find ironic, that you find most parochial schools and private religious schools studying evolution intently with the materials that are available that the secular schools are using, and looking at it and analyzing it critically. And, you know, this local Christian school brings in biology professors on occasion and says, "All right, you have an hour, convince us."
It is great, you know? I think it is really a valuable tool for these kids.
Q. So Pandas and People is a supplemental text in that school?
A. Yes.

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Q. Can you tell me how you first got involved in this case, this litigation?
A. I was called up by one of the attorneys at Thomas More and asked if I would provide expert witness that -- I think they said Mike Behe had recommended that I would be a potential witness for it, and that was my contact.
Q. Do you remember approximately when you were first contacted by Thomas More about this lawsuit?
A. I don't know a specific date. I have it on my computer, I could go back and look at my e-mails and I can approximate it.
Q. Did you have any interactions with any of the officials of the Dover School District before you were retained as an expert?
A. No.
Q. Can you tell me what you did in order to prepare your expert report?
MR. WHITE: Now, just so we are clear, communications with counsel, that's all privileged based on our stipulation.
MR. LUCHENITSER: Whatever the stipulation is.
MR. WHITE: Right, so we are just talking

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about the face of the document, not behind.
THE WITNESS: Yes, I don't want to get into that, I don't know what the stipulation covers. I don't think it will become an issue.
But what did I do to prepare it?
BY MR. LUCHENITSER:
Q. Yes.
A. I mean, there was a deadline involved, as I recall, and there wasn't a great amount of time to invest. So I think I spent a total of 12 hours sitting down on my computer, typing, revising, thinking, you know, and then submitted it.
Q. So is that the total amount of work that you did in order to prepare the report? Was that just the time you spent writing it or --
A. I did it over the course of probably a week and a half, but the actual time that I committed to this, which I was keeping track of just for remuneration aspects, was probably about 12 hours.
Q. And did you review any documents before starting to write your report?
A. I had written my report and I consulted some of the references, some of these books just to clarify some of my positions, the semantics that I

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wanted.
Are you asking if I looked at any of the other expert witness reports?
Q. Did you look at a --
MR. WHITE: Like a court file? What are you talking about?
THE WITNESS: I had the complaint.
BY MR. LUCHENITSER:
Q. Yes, did you look at the complaint?
A. I looked at the complaint.
Q. Did you look at the answer?
A. The answer --
Q. The defendant's answer in the litigation.
A. I didn't spend a lot of time with it, because it would say point whatever this or that, and I didn't have the time to go back and look at what point are they talking about: He said this and it is referenced in -- you know? I didn't.
Q. Did you read a copy of the statement that is the statement that the Dover School District officials read to the students?
A. I did. I didn't study it, but I read it.
Q. Did you read any of the other expert reports prepared on behalf of the defendants?
A. I don't recall if I had already submitted

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mine and one of the attorneys from Thomas More sent me Mike Behe's report or that was just when I was finishing mine up in terms of the format of how I wanted it to look in terms of how this stuff was being done in other reports.

So I don't recall. Certainly I wrote this, and after I was just about done I looked at Mike Behe and thought, is this the amount of content that they want? Are these the subject areas that are pertinent? This is my first experience, so I didn't even know what the format of an expert report was. I think I asked to see in terms of how it is organized, do you put subheadings in it? How do you reference information and journals, et cetera? So it was more for format.

Q. After you were done with your report did you review any of the other expert reports that --

A. I have looked at a few of them. I have -- I don't know if I have all of them, but I haven't had time to read them in depth.

Q. Do you disagree with anything stated in any of the other expert reports filed on behalf of the defendants?

MR. WHITE: Are you talking about defendant experts or plaintiff's experts?

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MR. LUCHENITSER: Yes, defendant experts only.

THE WITNESS: You mean people on my side of the aisle?

BY MR. LUCHENITSER:

Q. Yes.

A. Not anything overtly that, you know, I have a gut reaction against.

Q. Is there anything specific you remember that you disagreed with?

MR. WHITE: Do you want to establish which one he has looked at, if any of them?

THE WITNESS: Yes. I have looked at Mike Behe's but I haven't read it in detail. I have Bill Dembski's that I have read about half of. I agree with most of what he has presented. I agree with Mike's analysis of the theory and how it is just a definition of a theory and how it is used in different contexts.

Who else? I don't know. I mean -- I haven't read the ones from the educators that are involved.

MR. WHITE: Did you also ask about the plaintiff's, Alex, or did you just say defendants?

MR. LUCHENITSER: Just the defendants.

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(Recess taken.)

BY MR. LUCHENITSER:

Q. Are you also being represented by the Alliance Defense Fund in this case?

A. No.

Q. Can you tell me who is paying your fees?

A. I don't really know. Is it Thomas More?

MR. WHITE: You are talking about his expert fees?

MR. LUCHENITSER: Yes.

THE WITNESS: I am assuming it is Thomas More.

MR. WHITE: He is retained by us.

BY MR. LUCHENITSER:

Q. Let's see, now, on page one of your report, somewhere you say, "Proponents of evolution recognize, as they must, the significant gaps in problems with the theory of evolution"?

A. Where are we?

Q. We're on page two, actually.

A. At the bottom of the page?

Q. Yes, see at the bottom of the page, the last paragraph at the bottom.

A. Right.

Q. Can you tell me what gaps you are

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referring to?

A. In terms of the gaps in the fossil record, in terms of the gaps in our understanding of synchronizing geological clocks with molecular clocks. These are all inherent in the articles that are referenced in my report. Simon Conway Morris, I mean, the whole article deals with problems of evolution. Carl Woese alludes to these as well. So this isn't anything that isn't in the peer reviewed literature.

Q. When you are referring to problems, are you referring to something different from gaps or are you referring to the same thing? Or are you referring to problems with evolution?

A. Problems in terms of intermediates, both at the molecular and the macro stage, developmental programs.

Let me give you an example. In a quotation on page three, by an article out of Nature that is co-authored by one of the expert individuals on the complaint side, Robert Pennock.

"From the outset, Darwin realized that 'organs of extreme perfection and complication,'" and this is a quote, from Pailee, such as the eye posed a difficulty for his theory. Such features

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are much too complex to appear de novo, and he reasoned that they must evolve by incremental transitions through many intermediate states, sometimes undergoing changes in function. There now exists substantial evidence concerning the evolution of complex features that supports Darwin's general model. Nonetheless," and this is my emphasis, "it is difficult to provide a complete account of the origin of any complex feature owing to the extinction of intermediate forms, imperfection of the fossil record, and incomplete knowledge of the genetic and developmental mechanisms that produce such features."

Q. What is the basis of your knowledge about the gaps and problems with evolution that you refer to?

A. Well, I mean, that's it. I mean, we don't have --

Q. Is it this article?

A. No, I am saying the highlighted aspects of Darwinian theory which are reliant upon fossil records that is consistent with gradual evolution are transitional forms, homology studies that can trace the phylogenetic history of subcellular organelles or components, genomic analysis in terms

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of comparing organisms that are related or closely related and accounting for information that is not present in either, genetic and developmental mechanisms that produce complicated structures.

Q. My question is, what is your basis for your knowledge about these things you have just been referring to?

A. I am a biologist, okay? I am a molecular geneticist. I have done developmental biology before in terms of dissecting these complex features in organelles. And I don't know any of my colleagues that can come up with a defined mechanism or scenario whereby they are able to appear simply under the neo-Darwinian theory. Okay? There is a lot of speculation and conjecture.

Q. Thank you. Are you aware of -- well, you make a statement at the bottom of page two, "We have no phylogenetic history of a single biochemical pathway or subcellular organelle."

Are you aware of any published articles that have provided such histories?

A. No, I mean, that's a statement by James Shapiro at the University of Chicago who is a not an intelligent design expert.

(Deposition Exhibit No. 17 marked for

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identification.)

BY MR. LUCHENITSER:

Q. We have marked as Exhibit 17 an article entitled: Mitochondrial Evolution, by Michael Gray, Gertraud Gurger, and B. Franz Lang. Is this an article you have ever seen before?

A. I haven't read it.

Q. So if you could, look at page 1478, the highlighted portion.

A. Right, phylogenetic relationships among mitochondria and alpha-Proteobacteria.

Q. If this article provides -- if it is the case that this article, Phylogenetic History for Mitochonddria, would that change your opinion that you express in your report that we have no phylogenetic history of single biochemical pathways as a --

A. I don't think this is a defined phylogenetic history. I think this is based on sequence comparisons, and there are inherent assumptions built into that system.

No, I don't -- I would read this, but I don't think this is a definitive historical account of the evolution of mitochondria. It is a hypothesis based on sequence comparisons.

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Q. Let's go to page three of your report. You say, "Proponents of Darwin's theory of evolution," this is like after a long quote. You say, "Thus, the proponents of Darwin's theory of evolution assume that evolution is true, even though we lack the intermediate structures, we lack fossils, and we do not have adequate knowledge of how natural selection can introduce novel genetic information."

Now, when you say, "We lack the intermediate structures, we lack fossils," are you speaking only about microbiological systems or are you also referring to fossils and intermediate structures with respect to complex animals?

A. From a legal perspective I can see where you are going, because you've established that I am not a paleontologist, I am not, but this is from the general scientific reading, Stephen J. Gould, other people that I have read, that have acknowledged, in Simon Conway Morris's article, that is really rephrasing of the statement above, right?

What I see Lenski saying is, we know evolution is true but we don't have a complete account of any complex feature owing to the extinction of intermediate forms.

Let's go back, I want to clarify this paper here on mitochondrial evolution. This is written –

MR. WHITE: Just to clarify, Exhibit 17.

THE WITNESS: Exhibit 17. You are saying this is a phylogenetic genetic history, this was published in 1999. Here is Lenski and Pennock saying, in 2003, that we don't have the complete origin of any complex feature, which would include a mitochondria, owing to the extinction of intermediate forms, et cetera, et cetera.

So what does that mean? This is a contradiction that you are -- it's in the literature. This is making an assertion. I haven't read this paper and come to the context of what they are basing their phylogenetic history on in Exhibit 17.

But you tell me how you can have these two statements in peer reviewed literature and they are consistent.

Q. Let me ask you, the statement you are quoting from the Lenski article is that he is saying it is difficult to provide a complete account of the origin of any complex feature. Is that the same thing as saying that there is no phylogenetic

history at all for any biochemical pathway or subcellular organelle?

A. Combine that with other statements. Again, James Shapiro, I can't remember – I can't recall the guy's name, he is a professor emeritus at Colorado State University, that has also written in journals, microbiology journals, stating the same thing. We don't have the phylogenetic history of any subcellular organelle, all we have is a lot of speculation, okay? I mean, do you agree with that? I guess I shouldn't ask you, you are not part of this. Okay.

I mean, as a scientist, this is not in conflict with my colleagues in terms of what we know and understand.

Q. Let's go back to this question of intermediate structures. When you say we lack intermediate structures, do you mean that there are no intermediate structures at all?

A. There are some. Those are the exception, not the rule. There are individuals that are evolutionists that are quoted in Simon Conway Morris's article that have gone so far to account for the lack of intermediates saying, well, in actuality they don't exist because we have these

hopeful monsters that can be produced by mutations and homeotic genes, and we can make these quantum leaps in body plans.

So in part, trying to account for the lack of information, you hypothesize that, well, they never were there in the first place, we can make these grand transitional leaps based on rearrangements or mutations and homeotic genes that are dictating body structure and plan. Okay? In part to address this problem. That's in the peer reviewed literature.

Q. Now, when evolutionary biologists do identify intermediate structures between various kinds of species, aren't there always going to be other intermediate structures that are missing in between what has been identified?

A. In a sense you can play that game of infinite regression. But at this point I don't think it is necessary to evoke that, you know?

Q. And can you explain what you mean by the game of infinite regression?

A. In other words, where did that intermediate come from and where did that intermediate come from, and, you know, a complete lineage. We have such gaps, you know, at this point

-- we have been searching for fossils for a pretty long time, and the intermediates are the exception, not the rule, and they are generally in the same group of organisms. Okay, and this is driving in part evolutionary biologists and it is causing problems.

Q. What level of intermediate structures would satisfy you?

A. I mean, I would have to think about it. It is going to be a body of evidence that is going to convince me. I'm not going to -- give me a true phylogenetic history that is not based on interpretation or that has been allowed to be examined critically by people on both sides of this issue.

Q. Is it feasible that the fossil record will ever become detailed enough to satisfy you that evolutionary theory is correct and intelligent design is wrong?

A. That's speculation. I mean, on a present track record, it doesn't look like it.

Q. And might that be because there aren't enough surviving fossils to be able to make the reconstruction that you would be happy with?

A. That's a question that implies a certain

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interpretation. Not surviving fossils, implying that they were there at one time and weren't preserved, or the fact that they never were there in the first place. Regardless, if you don't have the data, you can't make the conjecture. Okay? Whereas you have to recognize that you are dealing with speculation.

Q. Let's assume hypothetically that we are not -- that science isn't going to find a whole lot more fossils just because they have been destroyed, because they haven't survived. How could it be possible for anybody to then make a conclusion as to whether evolution theory is correct or whether intelligent design theory is correct?

A. Well, if you go by the data and you say, what does the fossil record -- what is it most consistent with? You know, from my understanding of the fossil record, stasis is the norm, okay? Change over time.

There is a fossil bed 40 miles to the east of us in Clarkia, Idaho that you can walk out there and pay five bucks to a guy that is running a motor-cross field, pick up a piece of shale, crack it open, and you have got magnolia leaves that are so well preserved that they are still green that are

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dated at 20 million years old. You can isolate by PCR mitochondrial DNA and compare it to magnolia mitochondrial DNA and there isn't a whole lot of difference. That's a long time.

So I am saying stasis -- Darwin predicts that this is a gradual transition. With that prediction is that there should be a gradual blending of forms all across the board, and you don't find that. You find, again, forms that we find presently.

Turtles, you can go back a long time in the geologic record and find things that looked like turtles, trees, et cetera, insects that you can identify through the species.

Q. Now, the statement you made about the fossil record, is that based on any personal review or analysis of the fossil record?

A. This is from my knowledge of reading that I think is substantiated by peer reviewed literature, by knowledge of work that I know my colleagues are doing here at the University of Idaho, okay? But, no, I am not a paleontologist and I'm the first to admit it. I'm not an expert in that field.

But there is public evidence, there is

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the recognition by evolutionists that they have a problem. This is implicit in some of the papers I have have quoted in my expert report. I don't think it is an area of contention. We are missing intermediates, it's a problem.

Q. Now, you also say in that same statement we have been talking about, "We do not have adequate knowledge of how natural selection can introduce novel genetic information." Are you aware of any scientific literature that does explain how natural selection can introduce such information?

A. I am aware of the immune system that is referenced in Exhibit 7, which we haven't discussed. At one point this the exception in which you can generate novel amino acid sequences in the immune system, where you can scramble genes as cassettes and have differential gene splicing and get components of proteins that are then spliced together that have different sequences.

Q. So is it correct, then, that natural selection can introduce novel genetic information in some circumstances?

A. That's not what I said. That's not saying that natural selection produced this. In fact, the immune system is a very dangerous system.

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Anytime you have this novel scrambling of DNA sequences, it has got to be fairly controlled or it can be a problem. I look at the immune system as an incredibly engineered system that has, you know, anticipatory foresight in terms of the organisms that possess them.

(Deposition Exhibit No. 18 marked for identification.)

BY MR. LUCHENITSER:

Q. We have marked as Exhibit 18 an article by Manyuan Long, Esther Betran, et al, entitled: The Origin of New Genes: Glimpses From The Young And Old. Is this an article you have ever seen?

A. I haven't read this one. I would like to, though.

Q. From the abstract in the article can you tell whether you are familiar with the work described in the article?

A. Can I read it?

Q. The article or just --

A. No, no, the abstract.

Q. Oh, sure.

A. "Genome data have revealed great variation in the numbers of genes in different organisms, which indicates that there is a

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fundamental process of genome evolution."
That's an assumption. The origin of new genes. "However, there has been little opportunity to explore how genes with new functions originate and evolve. The study of ancient genes has highlighted the antiquity and general importance of some mechanisms of gene origination, and recent observation of young genes at early stages in their evolution have unveiled unexpected molecular and evolutionary processes."
Okay, I would know -- if I sat down and read this I could do a critique of this in terms of a different interpretation from a design perspective, or a limitation of the application of this, I think. I am making that assumption.
Q. But you are not familiar with the specific work that Long and Betran describes?
A. No.
Q. Now, you said -- on page four of your report you say that the flagellum is the most efficient machine in the universe, that's the second sentence on page four, "People working on the bacterial flagellum" --
A. Right, Howard Berg gave that in a seminar at W.S.U. in 1989 in which I was in the audience.

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Q. And is Mr. Berg an expert on the flagellum?
A. Yes, a biophysicist, he's at Harvard University.
MR. LUCHENITSER: Let me have this marked.
(Deposition Exhibit No. 19 marked for identification.)
BY MR. LUCHENITSER:
Q. We have marked as Exhibit 19 an article on Physics Today on the web. It is a feature article, Motile Behavior of Bacteria, by Howard Berg. And if you could flip to page six, and the page number is in the lower left-hand corner of the article -- I may be looking in the wrong place.
If you look at the first paragraph at the top of the page, not the stuff in small type, the paragraph starting with, "Flagellar mechanics." At the end of the paragraph it says, "This scheme may not be very efficient, but it works."
So is Mr. Berg saying that the flagellum is not in fact very efficient?
MR. WHITE: If you would allow Professor Minnich time to read this.
THE WITNESS: I think what he is

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referring to here is the chemotaxis process, which is a random lock which is, you know, a very, very primitive sensory transducing system. This isn't referring to the motor itself, this is referring to the mechanism in which this motor is hard-wired to the chemotaxis system, which if -- and I am looking at the random walk up here in terms of tracking bacteria as they are taxing towards a stimulant that, yes, in one sense it is inefficient because you don't have, you know, a camera eye to look at the environment nor the neuron capacity to process that information. This is a phosphor relay system.
But I will add here, that this process is inefficient, but given the primitiveness of it, it is incredible in terms of how well fine-tuned it is to the environment. Bacteria are extremely small, on the order of micrometers in size, okay? They are subject to brown emotion, which means that just the molecular vibration of the environment can have an effect in terms the movement of these organisms.
E. coli is faced with a problem of, you know, there is probably an amino acid here that this organism is chemotaxing towards. It wants to run its flagella, once it is oriented in the right direction, toward that source of food. So, are you

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following my argument?
The problem is that brown emotion, over the course of four seconds, is going to deflect its motion 60 degrees off its original track. And that if you go longer than four seconds, that your direction towards what you have perceived as a source of, you know, the highest concentration of gradient to amino acid you want is over there, it suddenly becomes irrelevant and you have been pushed off course by brown emotion.
The chemotaxis system is fine tuned so that the half life of all these proteins that are guiding that process is on the order of two to four seconds, so that after that time period you make -- you know, E. coli is faced with this decision: I have receptors on my surface that are looking for what I want to eat, okay? I have got to take as many samples as I can over the longest period I can so that I can make a decision to go in that direction. If I wait too long, then my decision is irrelevant because I am pushed off course by brown emotion.
The system is fine tuned and extremely efficient given the parameters to ensure that E. coli can wipe the slate, reverse its engines,

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tumble, and then start off in a new direction.
Again, I haven't read this. In reaction the cell body translates and rolls, so there is torque with these engines that can also -- you know, is a problem with aircraft engines, you know? The old radial engines that the torque driving it could also pitch an aircraft in the direction in which the propeller is rotating, and that has a problem in terms of staying on course.
(Deposition Exhibit No. 20 marked for identification.)
BY MR. LUCHENITSER:
Q. We have marked as Exhibit 20 an article by Edward Purcell from October 14, 1997. Let me draw your attention to an abstract at the top in smaller type which apparently was written by Berg. And there is a highlighted passage there that says the, "The propulsion efficiency cannot exceed 3 percent under any circumstances, and with more realistic values he estimated a maximum of 1.7 percent."
Does that contradict your opinion that the flagellum is the most efficient engine --
A. That's -- I am quoting Howard Berg, you know, in terms of how he looked at it. I think

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looking at it holistically in terms of the fact that it's a self-assembling motor, it's got all the components that we find in a true engine that is water-cooled, it has two directions, two gears forward and reverse, you know, a true propeller, et cetera, is run on battery power, in terms of the fact that you can have an engine that can self-assemble, that's pretty efficient.
In terms of the propulsion, I don't know in terms of the context, I haven't read this paper. So we may be talking about about two different thing here. I don't want to confuse the issue. I'm not sure it's fair to pull this out and talk about efficiency, efficiency of what?
You know, one of the articles that I cite, Kinosita in Cell on page four, talking about another rotary engine, and he says that the efficiency of this motor, quoting directly, "If one ATP is consumed per 120 degree turn, as one may anticipate from the make of this motor, the efficiency is nearly 100 percent, far superior to a Honda V6."
So again, I want to clarify the context, that we are talking about the bacterial flagellum.
MR. WHITE: For the record, the quote

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that Professor Minnich just read was on his expert report, was it not?
THE WITNESS: Right. So, you know, I would like to read this and get the context, but --
BY MR. LUCHENITSER:
Q. We can come back to that at trial.
You said the flagellum is water cooled, can you explain what you mean by water cooled?
A. I mean, again, that's based on Howard Berg's description of it. I mean, these organisms are growing, for the most part, in a liquid environment. They can be rotating at up to a hundred-thousand rpm's. I don't know how much frictional force or heat that generates, but it has been said that they are water cooled.
Q. Do you know what protein in flagellum are responsible for that cooling system?
A. No, I don't. It could be just the fact that you are in a liquid environment and there is water flowing freely through the membrane and this is playing a part in terms of dissipation of heat.
Q. Okay, on page six, let's see, where is it? In the middle of --
A. Can I clarify one thing, too? Going back to this efficiency and the language that has been

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used in the past in terms of describing the machines that are in discussion here.
I find it interesting that 10 or 15 years ago these words like highly efficient, you know, most efficient, you know, esoteric words like beautiful, et cetera, fine tuned, well designed, in the literature are now being replaced with things like, "Well, this is a Rube Goldberg apparatus," or, "This is sloppy," you know?
Mark Pstahe, in his book The Genetic Switch, in describing the repressor of Landa protein, said this is exactly -- you know, he says, all the parameters that are required for the expression of the genes he is talking about is exactly what you would do to design a repressor.
And now, I think, getting caught by that language, I find my colleagues going back and using this. Now Mark Pstahe looks at Landa repressor as, you know, a sloppy system, just what you would expect as an undirected, unintelligent driving force producing it.
Our knowledge of Landa repressors hasn't changed, you know? But the language we are using is. I find this in the literature, and it is perplexing to me in terms of why suddenly people are

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changing their view. I think it is because of the fact that the language that we have used to describe these systems in the past is very descriptive teleologically, efficiency, engineering, the same language you would be describing intelligent design processes.

Q. You say on page six, the first paragraph after the quote, "The fact of the matter is that the scientific evidence for real design is overwhelming." Now, if that's the case, why is evolution and not intelligent design not the dominant scientific theory of the developing science?

A. That's a good question. Like I said, I asked my colleagues, "Given all of our admittance that these things have the appearance of design, why won't you even entertain the idea that it is real design?"

And the response overwhelmingly is that they don't like metaphysical implications. This is a human response, it's a religious response, it's a philosophical response, it's no different than Einstein looking at the implications of his equations and saying, whoa, the universe isn't static. And that is loaded with metaphysical

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ramifications. So, you know, it is dangerous stuff.

Q. When you use the word overwhelming, do you think you might have used too strong a word there?

A. Oh, I am -- you know, perhaps. But Francis Crick says, looking at nature you have to continually convince yourself, I am paraphrasing him, that what you are seeing is not designed, okay?

Why? Why do you have to convince yourself that what you are seeing is not designed? Maybe it really is. Why aren't you willing to entertain that idea and why isn't it a legitimate avenue of inquiry? Why can't we develop mechanisms to differentiate real design from the products of natural laws?

Q. Is it correct that you have done some experiments on the Touran shroud?

A. Oh, no. I was --

Q. You helped design experiments; is that correct?

A. I was kind of an informal -- I wouldn't even say a consultant, an advisor to a guy that was interested in coming up with a natural explanation for what people have assumed is a supernatural product, and just illustrated or outlined, in the

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course of about 45 minutes, Well, if this is your hypothesis, that you can take a painted piece of glass and put it over a piece of linen and with the sun rotating across the horizon, can imprint an image that -- you need to do controls, you know? You need do -- if you think the sun, as it is changing across the horizon, is blending the image, do the same experiment and abase it with a sun lamp. Do it horizontally, et cetera. And that was my limit in those experiments.

Q. Did those experiments in any way influence your thinking about intelligent design theory?

A. No, no. But I think it is -- again, you are looking at a phenomenon and asking the question, is this real, is this a supernatural event, or is there a natural way that you can explain it? And I'm all for saying, all right, this guy has a theory for a natural explanation that nobody has looked at before and do it. You know, I don't have a problem with that.

Q. Let's go back to page one of your report. And you say --

A. Can I clarify one thing? I was in Iraq when these experiments were actually performed and

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had no input other than that.

Q. Let's go to page two, the top of page two, the third full sentence: "Evolution is such a broad discipline that it has in reality played only a minor role in experimental science."

A. Carl Woese says that, Simon Conway Morris also, you know, refers to that in his paper, and these are Microbiology and Molecular Biology reviews and the other one is in Cell.

Q. Are those two papers the primary basis of that statement that you make there?

A. No, I mean, again, it goes back to my own experience. I have been a contributor to my discipline, I never once took a course in evolution that has been required. I haven't gone to the bench and used any principle of evolution in designing and carrying out an experiment, nor, when I ask my colleagues, they haven't either.

Q. Now, did the scientific theory of evolution play any role in the discovery of heredity?

A. It would have been found regardless of whatever paradigm was invoked. The question -- you know, who discovered heredity and when was that discovered? In the eighteen-sixties, the same time

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Darwin was writing his book, Gregor Mendel was doing his experiments on peas and inheritance in peas. He is a Catholic priest. So, no, he didn't know about evolution.

Q. What about the discovery of genes, did the theory of evolution in any way aid in that discovery?

A. I think retrospectively. But again, this was a question, a major question that was driving biology, you know, in terms of what is the nature of the gene, what is life? Schroedenger's book as a physicist asking, "Can we describe inheritance in chemical and physical properties?" It doesn't say anything whether or not it was an evolved entity or not.

Q. Does the scientific theory of evolution play any role in medicine?

A. I teach in the medical program here, you know, for med students from Idaho that are in the University of Washington program. So we have 20 slots, W.S.U. – or Washington has 20 slots. So I teach infectious disease to close to 40 medical students.

I am not aware that evolution is an integral part of their scientific training. We can

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use evolution studies in terms of designing of molecules or therapeutic agents, like protease inhibitors using a random type of synthesis of amino acids or RNA zip codes for amino acids and get something that sticks to those proteins.

But that's kind of due to the fact that we don't now have the properties whereby we can predict the three dimensional structure of proteins and actually go to the -- or are we starting to the point where we can actually go to the computer monitor and call up these structures and model another protein and how it will interact.

Q. Is the scientific theory of evolution important to the development of the antibiotics or to doctors' decisions as to when antibiotics should be prescribed?

A. I think, you know -- well, I address part of that in my expert report in the terms of antibiotic resistance as a paradigm for evolution. I think because there is such a strong fitness cost associated with spontaneous mutations that can bring about antibiotic resistance, that long ago we should have instituted a regimen where you introduce the antibiotics for a given time period on a national and international level and then remove them before

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resistance can present itself in the compensatory mutations necessary to give that organism in the niche of a mammalian host the ability to compete. Okay?

So I think there are components that are involved in micro adaptation and looking at these things from a design perspective that could have been implicated long ago.

In part I think this is where evolution can impede science, because you look at antibiotic resistance, it appears, what are we going to do? We've got to go get another drug?

No, I think you could pull things off, recognize there is a fitness cost with it before these compensatory mutations then appear locking that organism into that environment and maintain the use of these antibiotics for a longer period of time.

(Off the record.)

BY MR. LUCHENITSER:

Q. Can natural selection and random mutation, can those processes improve organisms or can they only lead to the degeneration of organisms or design forms?

A. Can natural selection lead to the

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improvement of organisms or only the degeneration of organisms? I think you will find examples of both.

If I can clarify that? Again in my report, there is a hypothesis in biology in evolutionary circles in terms of Meuller's ratchet. A mutation has a cost that is associated with it, and it, under given conditions, inhibits the organism's ability to change to differing environmental insults or changes. We can demonstrate that in the lab.

Q. Let's go to page three, and there you are discussing something, you discuss orally a paper by Lenski. Let me pull out the paper I think you are relying on.

(Deposition Exhibit No. 21 marked for identification.)

BY MR. LUCHENITSER:

Q. Now, we have marked as Exhibit 21 a paper by Lenski, Winkorth, and Riley called: Rates of DNA Sequence Evolution in Experimental Populations of Escherichia coli During 20,000 Generations.

And in your report you -- well, in your report you characterize the paper as to --

A. This isn't the same one that I am referencing.

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Q. I think you might have had a -- the reference might have been -- so we don't spend time on this, we pulled the paper that cited it here and it didn't seem to be the paper describing these experiments, this seems to be a paper that actually describes the experiments.

A. I'd have to go back and check that.

Q. But on page 506 of this paper it says, at the end of the paragraph that carries over from page 505, so the first paragraph on 506 there is the conclusion that, "The average population has accumulated fewer than 10 synonymous substitutions in its genome during 20,000 generations."

And in your report I believe you said, "The admitted results of these experiments are that it is remarkable how little change does occur."

What is your basis for making the judgment that 10 changes in 20,000 generations is a small amount?

A. Well, I mean I am extrapolating from our perspective, what is 20,000 generations in human experience? 20,000 times 20 years average generation, 400,000 years. I mean, in terms of the evolution of man over that time period, it is pretty significant.

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Q. How long is bacterial generation?

A. Twenty minutes.

Q. So if there is a --

A. I don't know. I mean, the optimum generation for E. coli Saccharomyces is going to be longer. What are we talking about here? E. coli, okay.

Q. So if you have 10 substitutions every 20 generations couldn't that add up to a huge change over millions of years?

A. Wait a minute, this is over 20,000 generations you have 10 mutations? Clarify what you just said.

Q. Yes, based on this conclusion, over millions of years couldn't that rate of change add up to very substantial changes in the population of bacteria?

A. That is speculation in terms of how many mutations can be tolerated in this organism. You know?

Q. Have you done any analysis independently of what kind of change that rate of -- what kind of changes in the population can be produced by that rate of change over --

A. Well, you can run out the math and say,

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okay, I can have, you know, what, 50,000, 100,000 mutations, but that's irrelevant in terms of what you are going to have and what E. coli can tolerate and how many genes are going to, you know, be involved in this process.

My point is, over 20,000 generations under these conditions, you don't have a lot of change, and my interaction with people that are doing these types of experiments are, I think sometimes over-interpreted.

Frank Rosenzweig, who was in this department and who is now in Montana, has been doing these experiments -- I don't know if he came out of Lenski's laboratory or, you know, a laboratory as a post doc doing similar things, where you can put Saccharomyces cerevisiae under stress conditions where there are low levels of glucose, run it out to 20,000 generations and ask what happens. Well, you see an efficiency the organism to grow on these low concentrations. You get gene amplification for key genes in the pathway that are involved in either the enzymatic breakdown or the transport in.

But the question remains, all right, add glucose back to point 1 or point 2 percent and what happens to your changes? I would predict that you

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are going to recombine them back out if you have any amplified genes. And this is what happens in bacterial systems.

So we have changing environments. Our experience, when we are doing these experiments in the real world, are examining under natural conditions that you are fluctuating across a mean. You can have selection over a time period, but as environmental conditions change, you go back to a base line. You are always fluctuating around a mean. This is the experience of the Grants in the Galapagos Island study with Darwin finches.

Again, this is the type of experiment that I think is disingenuous to the argument. You can show antibiotic resistance overnight in bacteria. You can show mutations conferring difference in pigmentation in moss, and then you ask the students, speculate over millions of years these gradual processes are occurring and what will happen to that organism?

Well, yes, I mean, you can say given that there is no cost to mutations, that I can go from E. coli to a mouse, right? But in actuality, that's extrapolation.

Q. In your report, primarily on page seven

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and also starting at the bottom of page six and some other places, you purport the proposition that techniques essential to design engineers and not the theory of evolution have produced the vast inroads we have made in our understanding of the cell.

A. Right.

Q. And do I understand correctly that this is -- your claim is based on the experimental processes that molecular biologists use to figure out how cells work where they selectively disable genes?

A. Right, I mean, this is what Carl Woese's complaint is. We have ignored evolution -- there are scientists that have looked at evolution as being inconsequential or irrelevant to the study of biology. The process that produced this tremendous revolutionary understanding of the cell is a reverse engineering process. That is consistent with the design hypothesis.

Q. Now, how is intelligent design theory helpful to people who conduct these experiments?

A. I mean, it is an engineering process, just like going into a shop and looking at a motor, or something, and you are not quite sure how it works. You don't have the blueprints, you start

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pulling pieces off and asking how does that affect function, all right?

Q. But once someone understands this technique, this experimental technique, what does knowing about intelligent design theory add to their abilities as a biologist?

A. You ask me. Now, Bruce Alberts, in another paper that I submitted as part of my expert report, says that, "Design engineering principles should be incorporated into our college curriculum for biology students." Because we dissect these organisms, we are going to ask the next series of major questions in terms of how these machines interact. That is very, very similar to how a design engineer looks at the interaction and optimization of machines that are all functioning in concert. All right?

So this is my question that I bring up. If we are going to require design engineering as part of our curriculum, are we going to benefit from that as a discipline? Yet we have ignored the incorporation of evolution. I wasn't required to take it. Very few people that I know of in my field have been required. Design has a lot to offer in terms of understanding biological processes and how

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these consortium of molecular machines are working in the cell.

Q. On page three, at the bottom of page three, The last paragraph, you use the term apparent design?

A. Right.

Q. Is that a scientific term?

A. That's taken from Dawkins' book: The Blind Watchmaker.

Again, he poses the question, "All biologists agree there is design in nature. Is it real design, the product of intelligence, or is it only apparent design that we can explain by natural law and time, chance, and necessity?"

So apparent design looks like design but it's not really design, nature can do it in an unintelligent process.

Q. Does the term apparent design have scientific content or is that something just a lay person can conclude?

A. No, I think it has scientific content. This is the thing that evolution has to deal with. You know, we all recognize that there is design in nature, and I think the evidence is overwhelming that it is design. It has always been an integral

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part of natural history throughout recorded history until Darwin's theory, and, you know, we are in a unique time period where the materialists' paradigm is dominant.

But this has been a question going back to the Greeks, you know? Is the eye a product of nature by itself or is there a designer?

But it is a real question and there are two answers to that question. Why do we exclude one avenue of inquisition? And in my view, recognizing that can have consequence in the progress of science?

Q. Can you identify something that exhibits apparent design but that you believe was not in fact designed by intelligent causes?

A. I think there are examples that you can look at. The Man Mountain in Vermont, or whatever, that is part of their state symbol. You look at it from the side, it looks like the profile of a face. But you can go up to it and look at it from a different facet and see that it is really -- you know, that image disappears, it's a product of wind and erosion over time.

Similar things in terms of looking at the surface of Mars right back in the twenties and

thirties, it looked like there were canals and it was evidence that there was a past civilization or there were aliens living there. But from our perspective we can see that this is also the product of natural law.

If you look at Mount Rushmore, I think Bill Dembski uses that example, and there is no question because there is specificity. We recognize the profile of Teddy Roosevelt or George Washington or Jefferson from photographs and we can say that's real design.

All right, the same principles can be involved in application to systems that are under contention.

(Off the record.)

MR. LUCHENITSER: Okay, I am going to wrap it up, I don't have the time to go any further.

(Deposition concluded at 6:00 p.m.)

(Signature requested.)

CERTIFICATE OF SCOTT MINNICH, Ph.D.

I, SCOTT MINNICH, Ph.D., being first duly sworn, depose and say:

That I am the witness named in the foregoing deposition consisting of pages 1 through 294; that I have read said deposition and know the contents thereof; that the questions contained therein were propounded to me, and that the answers therein contained are true and correct except for any changes that I may have listed on the change sheet attached hereto.

Dated this____ day of_____ , 2005;

_____

SCOTT MINNICH, Ph.D.

SUBSCRIBED AND SWORN to before me this ____ day of _____ _____, 2005

_____

NAME OF NOTARY PUBLIC

NOTARY PUBLIC FOR_____

RESIDING AT_____

MY COMMISSION EXPIRES_____

REPORTER'S CERTIFICATE

I, NEIL O. COOLEY, Certified Shorthand Reporter, do hereby certify:

That the foregoing proceedings were taken before me at the time and place therein set forth, at which time any witnesses were placed under oath;

That the testimony and all objections made were recorded stenographically by me and were thereafter transcribed by me or under my direction;

That the foregoing is a true and correct record of all testimony given, to the best of my ability;

That I am not a relative or employee of any attorney or of any of the parties, nor am I financially interested in the action.

IN WITNESS WHEREOF, I have hereunto set my hand and seal this 3rd day of June, 2005.

_____

NEIL O. COOLEY, C.S.R. # 328
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My Commission Expires 02/25/08.